

2013

YOUR EXPERT GUIDE TO TODAY'S TECH

Dec 2013
Issue 396

FREE DISC INSIDE
Recover deleted data, record your screen, PC cleaning toolkit + more!

FIRST 4K MONITOR TESTED

Meet the 31-inch behemoth that makes 1080p screens look blurry

BUILD YOURSELF A

PINT-SIZED POWERHOUSE

Downsize without compromise!
Construct the ultimate lounge room media PC or a tiny gaming rig for the den

REVIEWED & RATED
MUST-HAVE ACCESSORIES FOR YOUR TINY PC!

HOW TO...

GET MOBILE-STYLE NOTIFICATIONS FOR WINDOWS

Make your Android lockscreen do more
Master OS X Mavericks' best new bits
Get started with Arduino

MINI-ITX MOTHERBOARDS AND CASES LABS TESTED

Pick the best parts to create a monster mini PC

SLIM GAMING LAPTOPS FACE OFF

The race to cram PC gaming goodness into slim, portable packages is on.



LONGER LIFESPAN FOR YOUR SSD

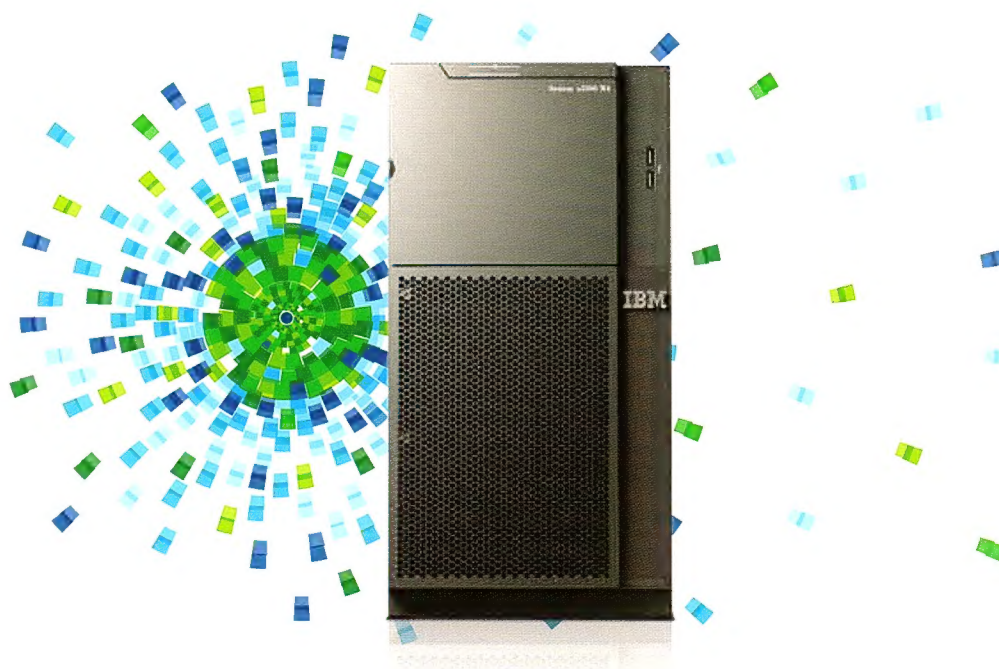
Can adding more memory help reduce SSD wear and tear?

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FIPP



THE LONG VIEW

APC's editor reflects on how rapid and unpredictable the mobile device revolution has been.

If you're the type of person who's interested in "speeds and feeds" (ie. the stuff under the hood in today's tech) then the smartphone – and now tablet – revolution has been a pretty riveting show to watch. That's because in many respects, it's essentially crunched down 30 years of desktop and laptop PC history into the space of just 5 or so years.

And yet while these are devices that are relatively young, we've already become a bit blasé. Take the launch of Apple's latest iPhones and iPads, for example. Most of the details of these had already been leaked weeks or months before their release, so there was little surprise left when it came to device form factor, build materials and even colours.

For a hardware enthusiast, there was one big surprise however – the fact that those new flagship devices now include 64-bit processors, where their predecessors had only been 32-bit. That's important because it really represents the maturation of the smartphone and tablet market – they can now run programs with the same complexity of code as our current desktop PCs and laptops.

Some may scoff at the idea that a smartphone needs a 64-bit processor – and a high-level Qualcomm executive, which makes the popular Snapdragon line of System-on-Chips, was recently reassigned to a different division because he did so publicly. In the

short term, he's probably be right to be sceptical. While 64-bit won't do much to help the current trend of slowing smartphone sales, as there's no immediate tangible benefit and it'll likely be some time before coders catch up and create apps that can fully use the new architecture (well, at least those outside of Apple).

What 64-bit gives the tablet and smartphone now is continued room to grow – and perhaps to grow into new places that have traditionally been the home of the PC and laptop. (And if that perhaps makes tablets and smartphones a little more PC like in their capabilities, then we're all for it.)

It's amazing to think that in such a short space the smartphone in your pocket has gone from being a cool tech toy to a device that rivals the PC on your desk. Are we headed for a future where the smartphone becomes our primary computing device? Only a fool would say with certainty that they know where this whole revolution will end up, but it continues to be a thrilling and surprising journey all the same – and, for us enthusiasts and technology lovers – one that's also been great to be a part of.



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Contents

Issue 396 Dec 2013

45

PINT-SIZED POWERHOUSE

Downsize without compromise!
Construct the ultimate lounge room
media PC or a tiny gaming rig for the den

**REVIEWED
& RATED**
MUST-HAVE
ACCESSORIES FOR
YOUR TINY PC!



74

STATE OF PLAY

FEATURES

45 MINI-ITX SUPERGUIDE

Our superguide will show you everything you need to know when it comes to building and setting up your own mini PC.

46 Really mini motherboards

52 PC cases go compact

58 Low profile CPU coolers

60 Letting off steam

62 Seeing the Big Picture

64 Lounge room-ready peripherals

70 The ultimate media PC remote

74 STATE OF PLAY

Can loading up your system with RAM improve your SSD's performance, reliability and longevity?

TECHNOTES

6 NEWS

The latest developments in the tech world.

10 GADGETS

Hot tech gear we want to own.

12 BUSINESS COMPATIBLE

How tablets, 3D printing and touchscreens are gearing up for business.

14 SHOW REPORT

This highlights of this year's Intel Developer Forum.

16 EPINIONS

See what APC's readers have to say.

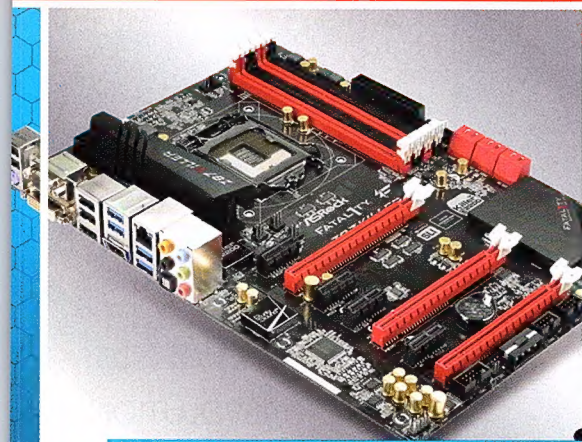
18 END USER

Not everyone is computer literate.

20 HOW IT'S DONE

Inside the Nvidia Shield.

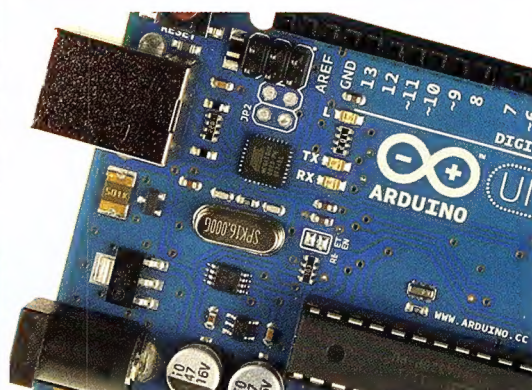
"One of the joys of this sort of thing is to do some trailblazing for yourself."
Pint-sized powerhouse, p45



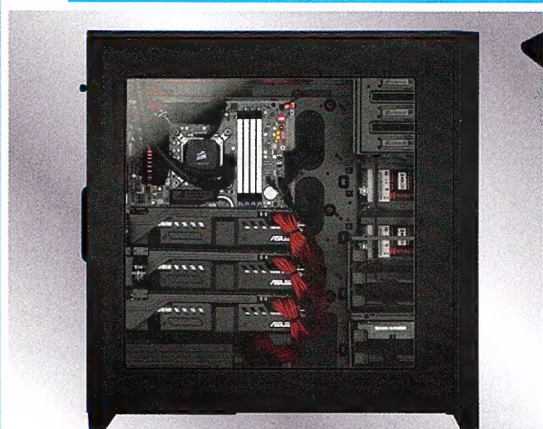
27 ASRock Fatal1ty Z87 Killer



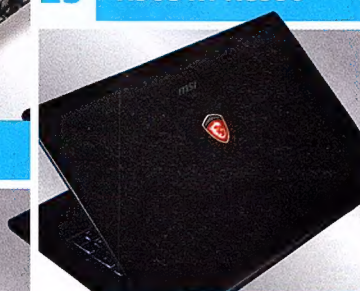
29 ASUS RT-AC68U



100 How to: Arduino masterclass



28 Corsair Obsidian 750D



36 MSi GS70



28 BenQ GW2760HS



109 Games: GTA V

THE LAB

24 LATEST REVIEWS

- 24 ASUS PQ321Q
- 26 ASUS Matrix-R9280X-P-3GD5
- 27 ASRock Fatal1ty Z87 Killer
- 28 Corsair Obsidian 750D
- 28 BenQ GW2760HS
- 29 ASUS RT-AC68U
- 30 Buffalo LinkStation 421
- 30 Epson Expression Photo XP-950
- 31 Plantronics RIG
- 34 Gigabyte P35K
- 36 MSI GS70 STEALTH
- 37 Samsung Galaxy Tab 3 8.0
- 38 Samsung Galaxy Note 3 4G

40 SOFTWARE REVIEWS

HOW TO

78 QUICK TIPS

We fix readers' computing problems.

82 TUTORIALS

- 82 Smarter Windows notifications
- 86 Sharing between Linux and Windows
- 88 Fine-tuning Mavericks
- 90 Create a custom iPad newspaper
- 92 Get the most from your Android lock screen
- 94 Create a Word doc with a macro

96 MASTERCLASSES

- 96 Web design: Animate infographics with CSS
- 100 Arduino: The world of Arduino
- 104 Android: Make your own ROM

DOWNTIME

109 GAMES

High-performance playtime.

114 CHIP CHAT

News from the world of geekdom.



» Abelssoft FileWing Pro 2013

» Ashampoo Snap 6

» Real World Racing

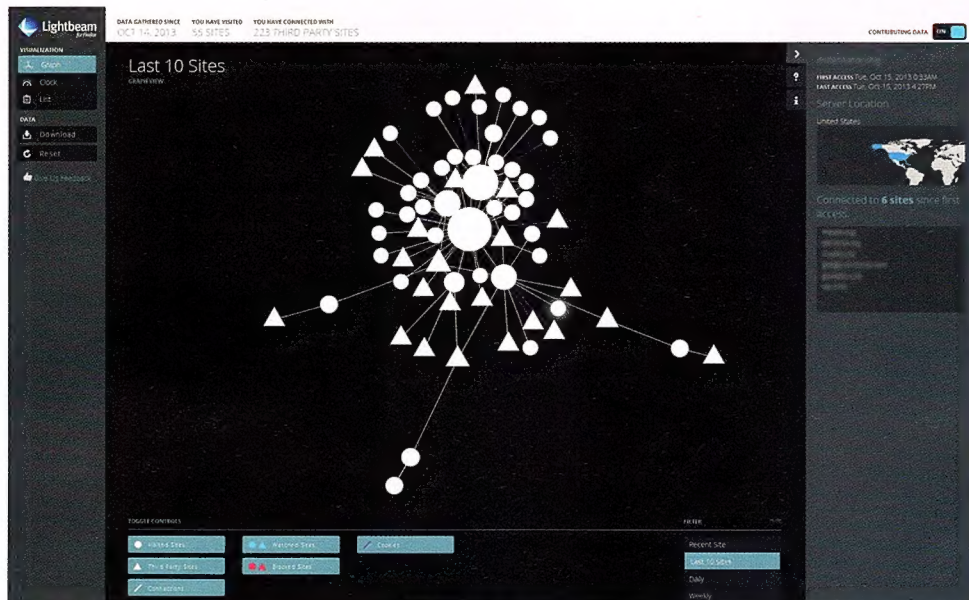
» 1-abc.net File Renamer 5

» Cleaning essentials toolkit

Find your disc inside on page 67.

technotes

» NEWS



Watching the web watchers

Consumers get a new weapon in the fight for online privacy. Kevin Lee reports.

Most of us are aware that on today's web, many companies are tracking and watching user data, but a newly-released tool from Mozilla can turn that around and let you be the one doing the watching.

Mozilla has released an add-on for its Firefox browser called Lightbeam, (www.mozilla.org/en-US/lightbeam) a tool that shows users which web sites are tracking and monitoring them online, and how they're connected.

The new add-on shines a light on the interconnections between sites that track user data, which are often linked either by direct connections or by passing user's web browsing cookies between third-party tools — the latter are widely used by social media, advertising, web traffic analytics and other services.

To the average user what Lightbeam reveals may just be an amusing (and disconcerting) look at how widely their data

is being tracked and shared as they move around the web. But it can also be a useful tool for the web curious and in educating people about web privacy.

WHAT'S THE 'FOX SAY?

In a press release sent out in late October, Alex Fowler, lead privacy and public policy maker at Mozilla, said that the company introduced Lightbeam because the internet needs transparency more than ever.

"While revelations about government surveillance continue to stun people around the world, there's a diverse range of third party companies that shape so much of our online experiences today, from advertising to social sharing to personalization," he said.

Fowler went on to explain that third parties are an integral part of the way the internet works today, but at the same time it has eroded the public's trust.

"With the Lightbeam for Firefox add-on and open data, we're providing a valuable

See who's monitoring your movements and who they're quite likely sharing that information with.

community research platform to raise awareness, promote analysis and affect change in the areas of tracking and privacy."

LAND GRAB

It would be naïve to think that Mozilla is doing all of this from the kindness of its heart, especially when Chrome has managed to erode Firefox's lead as the global web browser of choice. (Google's browser officially overtook Firefox in December 2011.)

While the cynical will say that Lightbeam is just another way of Mozilla bringing back users, it's arguable that this sort of openness has always been Mozilla's modus operandi. If you weren't there for the original 'Firefox versus IE' days, Firefox won many converts thanks to its open nature, which allowed a boom in add-ons (which were a novel concept back then) and personalisation features.

Perhaps it's time to give the old gal another look?



(A)PC REVOLUTION DECEMBER 1995

For this gargantuan beige-box bonanza, APC Labs tested over 100 desktop PCs (a feat that, to this day, is still yet to be bested) across three categories: consumer, corporate and high-performance. Prices ranged from a modest \$1,650 to over \$9,000.

December 1995 was yet another big transitional period for PCs; Windows 95 was available but relatively new and most of the machines we received used the more tried-and-tested combination of DOS 6.22 and Windows 3.11.

In terms of specs, how does 16MB (yes, megabytes) of RAM sound? A 1GB hard drive? How about a 100MHz Pentium processor? These museum pieces were cutting edge at the time.

THE NEW PC

This future-gazing story uncovered the big technologies set to revolutionise PCs in the near future, among them USB, 'integrated telephony' (no, not VoIP — actual PSTN telephone functionality) and LCD displays. We also predicted that, "All of your faxes and email messages will arrive in a single inbox. If you wish, the computer will read your mail aloud for you."



If Intel brings this technology to market, it will only be offered on its own branded SSDs.

Intel demos SSD overclocking

Will the chip giant be offering K-series 'unlocked' SSDs in the future?

Last month, Intel turned heads at several technology conferences by demonstrating solid-state disk overclocking, something that has never been possible before, due to the inability to access the controls that would allow it.

At both the PAX Prime conference and again at its own Intel Developer's Forum, Chipzilla trotted out a prototype SSD with custom software that allows a user to tweak both the clock speed of the SSD's onboard memory controller and the speed of the memory bus that transmits data between the controller and the NAND flash. Intel says it is considering offering the technology to consumers, but for now it's just setting about testing the waters.

EXTREME TUNING, INDEED

In the demonstrations, Intel loaded up its Extreme Tuning Utility (XTU) software and used it to control a prototype enterprise drive. The demonstrator began by changing the speed at which

the SSD's onboard controller was running, taking it from its stock 400MHz all the way up to 625MHz. Next, the demonstrator altered the frequency of the memory bus used by the NAND flash, going from 83MHz to 100MHz. Intel ran a few benchmarks to show the performance gains.

Admittedly, gains were modest, with most scores improving by roughly 10-15 percent; some benchmarks responded better to overclocking than others. What was most impressive was the ease at which the gains were brought about — a simple flick of the switch, essentially — but we're skeptical that anyone in the "real world" would even notice such a difference in what is already an incredibly fast device. The average user would barely notice a boost in sequential read speeds from 450MB/s to 500MB/s, for example.

RISKY BUSINESS

The bigger question here isn't whether overclocking will improve performance, as we know it will, but rather whether it will shorten an SSD's lifespan

or compromise data integrity in any way.

So far, Intel hasn't offered any specifics on what kind of impact it will have, but we know it will have some impact because, well, that's how overclocking works. Intel was also handing out surveys at PAX that asked people what they thought

will only work on Intel-branded CPUs. There's also a high probability that the settings will include bus-frequency adjustment, controller clock speed, and power-consumption levels, as well. As an example, you could possibly adjust the SSD's power settings like you do your display's, telling it to sip power if you're using a laptop, or

"The question is whether it will shorten an SSD's lifespan."

about SSD overclocking, and that included scary responses such as: "[I support] Unlimited Overclocking, the OS can always be re-installed," and, "I'd trade the life of the drive for more speed."

FOR INTEL ONLY

If Intel brings this product to market, it will be in the form of new K-series unlocked SSDs that are similar to its K-series CPUs. Reports indicate the capability will be accessible through the XTU software and

guzzle as much juice as needed if you're on a desktop.

COLOUR US UNCONVINCED

Though we appreciate Intel's initiative on this one, we have to say that the integrity of our data and the stability of our OS are much more precious to us than a hardly noticeable speed gain. We love overclocking, and we love SSDs, but in our opinion, the two should be kept separate. For now at least.

■ Josh Norem

1.2c

MONTHLY COST PER GIGABYTE TO BACK UP DATA TO AMAZON GLACIER

It might not be aimed at the consumer market so much (it's intended rather as a professional backup solution for enterprise customers), but there's no denying that Amazon Glacier's recently announced pricing for data stored at its Sydney data centre is very attractive. At just 1.2 cents per month per gigabyte, you could back up more than 100GB of personal data off-site (photos and other such precious digital keepsakes) and still have change from a twenty at the end of a year. Nice.

4

NUMBER OF YEARS DEROGATORY CIA PERSONNEL REPORT ON EDWARD SNOWDEN WENT UNNOTICED BY NSA

Four years before Edward Snowden blew the whistle on the NSA's covert monitoring of just about everything that happens on the web, his supervisor at the CIA wrote a 'derog' in Snowden's personnel report, citing "a distinct change in the young man's behaviour and work habits, as well as a troubling suspicion... [he] was trying to break into classified computer files," according to the NYT. The NSA was never alerted to the caution — and four years later found out the hard way.

128,250'

NUMBER OF PAGES INDEXED BY TORSEARCH

Underneath the everyday web we all know and love, there's another internet realm unseen by most PC users, sometimes dubbed the 'Deep Web'. Regular search engines like Google and Bing don't index there, and regular browsers like Chrome and IE won't be able to take you for a visit. This is where TorSearch can help you out, the recently launched search engine which exclusively indexes anonymous Tor resources. While the Deep Web is mostly famous for illicit activity — like the recently busted drug merchant 'Silk Road' — it's also host to lots of other non-illegal content, and Tor in particular has spiked in popularity after the NSA snooping revelations earlier in the year.

\$110m

VENERABLE BITTORRENT SITE ISOHUNT TO SHUT DOWN AND PAY US\$110 MILLION TO HOLLYWOOD

After a seven-year legal battle with the Motion Picture Association of America, one of the world's most popular BitTorrent sites, isoHunt, has agreed to call it a day, and will pay out US\$110 million in a settlement to Disney, Paramount, Sony, 20th Century Fox, Universal and Warner Bros. The previous judgment in the course of the litigation had held that the site knowingly infringed the copyright of the plaintiffs for profit.



RUMOURED NEW DISPLAY SIZE (IN INCHES) OF NEXT YEAR'S APPLE MACBOOK UPDATE

Twelve

It's fair to say that the uber-selling MacBook Air has been a phenomenal success, literally reshaping the notebook industry with its popularisation of the affordable thin-and-light laptop, now broadly known in PC circles as 'ultrabooks'. After three years of only very minor tweaks to the Air's present design, it's rumoured that Apple is taking things in a new direction in 2014, with a 12-inch 'clamshell' form factor. Will this kill off the current 11- and 13-inch MacBook Air variants?

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» GADGETS



TIKKER DEATH WATCH

US\$59 | WWW.MYTIKKER.COM

The Tikker is a motivational aid with a difference: it aims to promote "death awareness" by counting down exactly how many hours, minutes and seconds you have until you die. The hope here is that you'll use your time more constructively – or at least make some healthier choices to prolong your existence on this planet. The timer data is gleaned from a survey of your exercise and other health-related topics. The coolest thing about it? You can say the Grim Reaper is your personal trainer.

CASTAR

\$TBA | WWW.KICKSTARTER.COM

If you thought the holographic game of chess (well, chess with monsters) played by R2 and Chewie in the original *Star Wars* looked like a good way to while away a few parsecs, you weren't the only one. The famous "Let the Wookiee win" scene served as inspiration for castAR, an augmented-reality-meets-virtual-reality hybrid system currently in development that enables the wearer to view and interact with 3D hologram-like objects. The brain-child of two former Valve engineers who were let go by the company – but allowed to take their AR/VR baby with them – castAR was in Kickstarter funding at the time of writing (but surpassed its original US\$400,000 goal in just one day).



5.11 TACTICAL RUSH 12 BACKPACK

PRICE: \$99.95 | WWW.LEGEAR.COM.AU

Put down your broadsword and take up your mead and lute; the laptop bag grail-quest just ended. Purpose built for law enforcement, first responders and the military, the small form factor, 21 litre Tactical Rush 12 is made from 1050-denier nylon, kitted out with self-repairing YKK nylon zippers and packs a lot of storage options into its 30cm x 19cm over all size. There's a total of 16 compartments to neatly stash your hardware and keep your day-to-day gear safe including the bungeed laptop compartment and the 'Admin' pocket on the front of the pack which has more slots and pockets than a wardrobe of pants. The side compression, and chest straps also help keep your load close in times of crisis, or, you know, if you're late for the train. Plus it'll make you look bad-arse.



ANKI DRIVE

US\$199 | WWW.ANKI.COM

You can think of Anki Drive as a sort of redesigned version of slot car (aka Scalextric) racing — one that's been primed to take advantage of the age of smartphones. These little hot-rods connect to an Android or iOS smartphone via Bluetooth and you then use an app with on-screen controls to race them around an included track. (The latter comes as a gigantic roll-out mat with the basic kit.) What's really neat is that the designers have made it much more than just racing; it's effectively been crossed with *Mario Kart*, with enemy cars being AI driven and a range of virtual upgrades and weapons to kit out cars. Well, there's my 45-year-old brother's Christmas present sorted...

ADIDAS MICOACH SMART RUN

US\$399 | WWW.ADIDAS.COM

Sports geeks. They didn't even used to be a thing. In fact, for most of recent pop cultural history, if you were into sports, by definition you weren't a geek — and vice versa. (For more historical information on this rather fascinating dichotomy, see 1984's classic *Revenge of the Nerds*.) But now look at them. While the rest of us wait for smart watches proper to take over our wrists, the sports geeks basically own the category. The latest such fitness-focused effort to be announced is the SMART RUN, with Android 4.1.1, three user modes (offering from eight hours up to 14 days of battery life) and 3GB free storage for your tunes.



SUUNTO AMBIT2

\$599 | WWW.LEGEAR.COM.AU

You have to admit that watches have become a niche item in our arm arsenal considering a smartphone does pretty much the same thing and it's not until I rediscovered sport that the true value of a watch came to light. As well as the rudimentary functions we've come to expect, the Ambit2 features waypoint GPS navigation, track logging, POI creator, altimeter and complex weather functions, heart-rate monitor with real-time graph, interval timer, preconfigured multisport modes and a ghost runner mode (via app) to name but a few of its encyclopaedic functions. You also get access to 1000+ free Suunto apps geared to toward monitoring your performance and which when you get home can be transferred and analysed on your PC or Mac.



Android tablets are holding ground against the iPad juggernaut.

and we know what's going on in R&D departments to a degree."

This year, Gartner has plucked out tablets, multi-touchscreen displays and 3D printing to lead the pack for technologies with the potential to breakthrough into the enterprise.

TECHNOLOGY #1 — TABLETS

In the consumer space, the tablet explosion kicked off when Apple's iPad landed back in 2010. According to Gartner, such devices are poised to have a transformational effect on business within the next two years.

A survey by the analyst house conducted earlier this year found that 60% of consumers in Western Europe and the US use their tablet at least once a day for business activity.

"There's no question that tablets are going to work their way into the enterprise on all levels," says Escherich. "People are using them for anything from accessing email and company data or writing reports, whether that's using the tablet in the office or accessing company data at home over its network."

But what will be the most popular platform? Apple recently flexed its enterprise muscles with iOS 7, which introduced a multitude of new features to help mobile device management (MDM) providers offer better solutions.

However, Escherich says that Android tablets stand a real chance of catching up for two reasons. First, she says that the introduction of lower-priced models will boost popularity among consumers.

Then there is the increasing number of MDM solutions appearing on the Android platform, she adds, including "very interesting

BUSINESS COMPATIBLE?

How tablets, 3D printing and touchscreens are gearing up for business.

Remember when using your smartphone at work posed a real risk of it being confiscated until the end of the day? Depending on who your employer is, that may still happen.

However, bring your own device (BYOD) — the phenomenon of staff using their own personal devices at work — means that many organisations are now looking to foster productivity and boost business results by supporting employee-owned smartphones, tablets and other devices.

"People are bringing in private devices to the workplace that are technologically more advanced and easier to use than they have at work," explains Gartner analyst Meike Escherich. "As such, what starts off in the consumer space nowadays

ends up in the enterprise."

Each year analyst house Gartner identifies various consumer technologies with the potential to disrupt business over the next decade. It does this partly by studying data from its quarterly shipment forecasts.

Once collected, the results are made into the company's 'Hype Cycle for Consumer Devices', a document aimed at helping organisations time investments for when products go mainstream.

How does it define mainstream? "When around 40% of the possible market has adopted it," explains Escherich. "The possible market is something you could argue about forever, but that's the way we distinguish it. We track how many companies produce certain devices



It's still got a way to go yet, but 3D printing is going to have a big impact on manufacturing.

virtualisation and hypervisor-based software solutions."

Despite Windows 8 tablets making headway by introducing numerous form factors, such as hybrid 2-in-1 convertibles, devices totting Microsoft's tile-based OS are struggling to enter the enterprise, according to Escherich.

"I think we'll see a slow but continual update during 2014 when we've got the next technology CPU wave coming in with Bay Trail and Haswell, which are going to allow immediate on and greater graphic capabilities," she says.

Despite this, Escherich believes tablets totting Microsoft's platform will remain behind for the next "two or three years" in the consumer space, even if they are the preferred option for IT departments. "They favour them because they can run legacy applications and cope better with security issues."

Whereas other platforms are geared for general purpose use within business, Windows 8 tablets are more suited to individual use cases, explains Escherich.

"You'll find companies purchasing them for specific tasks, for example engineers in the field, or medical staff walking the wards," she says. "They're targeted quite specifically at verticals in that sense."

TECHNOLOGY #2 — MULTI-TOUCH SCREENS

It's safe to say that Windows 8 has yet to set the business world alight, and part of that is down to uncertainty around the benefits of using touchscreens — whether that's on a desk monitor or a tablet device.



Windows 8-based products are slowly finding their niche.

All-in-one units with multi-touch are gaining traction in business.

However, Gartner has counted multi-touch screens (screens with anything from two-point to 10-point touch functionality) as one of the three big consumer technologies to capture the attention of business users in the near future.

And how long will this take? "Less than two years," says Escherich. "It's creeping up on us and will be standard before you know it. It's come in via the smart phone and then moved onto the tablet and is now going onto laptops and desktops."

Escherich says that all-in-one (AIO) PCs with multi-touch monitors are a "particularly interesting segment" that's picked up traction over the last few years.

"They're flying off the shelves at the moment as they have touch capability," she says. "People like them for photo editing, changing screens and its intuitive nature."

The problem AIOs pose to both consumers and businesses is that of price, according to Escherich, who says that touch-enabled devices tend to retail with a premium price tag of "around \$100."

"That will only come down as the volumes increase, so it's a bit of a catch-22 situation," she says. "It's not going to happen with a big bang but you'll see quite clearly in 2014 that touch will begin to become standard in the consumer space."

Escherich says that the Internet of Things — a concept based on connecting everyday devices to the internet to control them and find new ways of taking advantage of data — is another driver behind multi-touch monitors both for consumers and enterprises.

Escherich points to multi-touch customer interaction terminals in airports and train stations. American supermarket chain Tesco went one step further last year by

putting up a huge virtual shop that allowed customers to buy products by touching items on the screen and scanning barcodes with their mobile device.

"We are already seeing touch screens everywhere. Go into an airport or big retail stall and you'll see big customer interaction terminals that have multi-touch," says Escherich. "You can use them to get your shopping delivered, book yourself into a hotel in the lobby and on aeroplanes."

TECHNOLOGY #3 — 3D PRINTING

The promise of making anything from parts to complete products in your slippers and dressing gown is a tantalising prospect (for consumers, that is... unless your business has an unconventional uniform policy).

According to Gartner, it's poised to have a transformational business impact within five to 10 years. 3D printing technology itself isn't new, but the company reckons it has advanced to the point where one-off and customised pieces can be created on devices costing well under \$1,000.

"3D printing isn't really there yet," says Escherich. "It's still primarily a business machine, and there's a lot of consolidation of technology providers going on."

One of the benefits of 3D printing is the ability to produce prototypes, Escherich explains, adding that it could also allow smaller businesses to produce replacement parts for devices in-store, while customers wait or return after a few hours.

"The problem holding 3D printing back is still price," she says. "There will be a difference between the ones that consumers pick up online and the ones manufacturers will buy, but it will definitely change the way we manufacture things." ■

Apple is still king, but its kingdom is getting smaller.



SHOW REPORT

IDF 2013

Braving SSD overclocking, 2-in-1 tablets and lots of 'mobility' talk, Dave James gets elbow-deep into the Intel Developer Forum.

Another September and once more the great and the grotty of the world's tech press descended upon San Francisco for the Intel Developer Forum. The first with new CEO Brian Krzanich at the helm, Intel was once more trying to redevelop itself. Where once Intel was a processor company, a few IDFs ago it tried to rebrand as a 'solutions' company. Now it's finally realised nobody either knew or cared what that meant, so this year we saw Krzanich labelling Intel as a 'mobility' company.

Realistically, Intel has been a mobility company for years. The last few generations of Intel CPUs have been increasingly focused on the laptop market, and it's long been trying to break into the tablet and smartphone markets, alongside its processor development. With the launch of the Silvermont architecture – and the newest iteration of the Atom processor, code-named Bay Trail – Intel could finally be about to gain some serious traction in those areas. Indeed, the main focus of this year's IDF was on this new low-power tablet system-on-a-chip (SoC), making it a rather different show from last year's Haswell affair.

The latter's successor, Broadwell, barely got a cursory nod, the Ivy Bridge-E chips were almost totally ignored and lip-service was only just paid to the new E5 Xeons. Instead, all the real noise was about new Intel-based tablets and the 'new category' of 2-in-1 computers. The irony that this was the first IDF in three years when I hadn't brought my 2-in-1 laptop wasn't lost on me as Intel wheeled out a host of new

units combining, in the words of Krzanich: "the best of a laptop and a tablet in a single device."

BAY TRAILING

So, Bay Trail then. Yes, it is an Atom processor, but don't let that fool you, this is a whole new start for Intel's low-power CPUs. In fact, continuing the Atom name might not be that fair to this new chip, as it's a proper out-of-order design, with the HD graphics of the Core processors finally making their way Atom-wards – with even the QuickSync video encoder hardware tipping up in Bay Trail.

Intel is talking about it in terms of being twice as fast as the previous generation Clover Trail Atoms and, to be fair, it might be a bit of a conservative estimate if our initial benchmarking

experience was anything to go by. We had a chance to our hands on Intel's reference-design tablets and see what all the fuss was about. And, despite a lower clockspeed compared with Clover Trail, we saw almost three times the multi-threaded performance in our Cinebench testing. Performance-wise, it's on a par with AMD's A4-5000 APU, but this is a chip with around a third of the power draw of the Kabini cores – those same cores that make up the PS4 and Xbox One. Things look even better when you put it up against the processors in the top tablets of today. Compared with the Apple A6X of the iPad 4 and the Qualcomm Snapdragon S4 in the new Nexus 7, the Bay Trail Atom Z3770 gives around 200 per cent better performance in HTML 5 and JavaScript-based workloads.

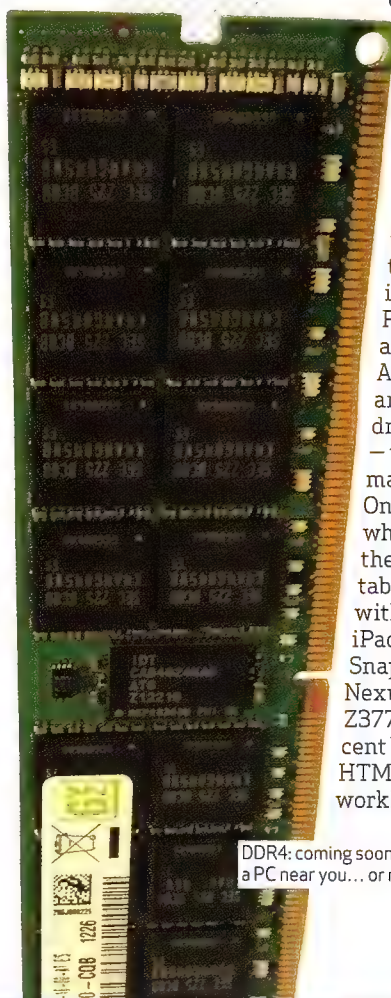
The thing that could give Bay Trail a real shot at the tablet market, though, is that it's compatible with both Android and Windows ecosystems. Manufacturers can make one design and have both Microsoft and Google operating systems catered for.

Bay Trail isn't going to be an exclusively tablet-based SoC, though. Much like the Atoms of old, we're looking at the architecture going into low-end laptops and the burgeoning 2-in-1 market. The new generation of hybrid laptop/tablets is Intel's great hope for clawing back the declining PC market from pureblood tablets.

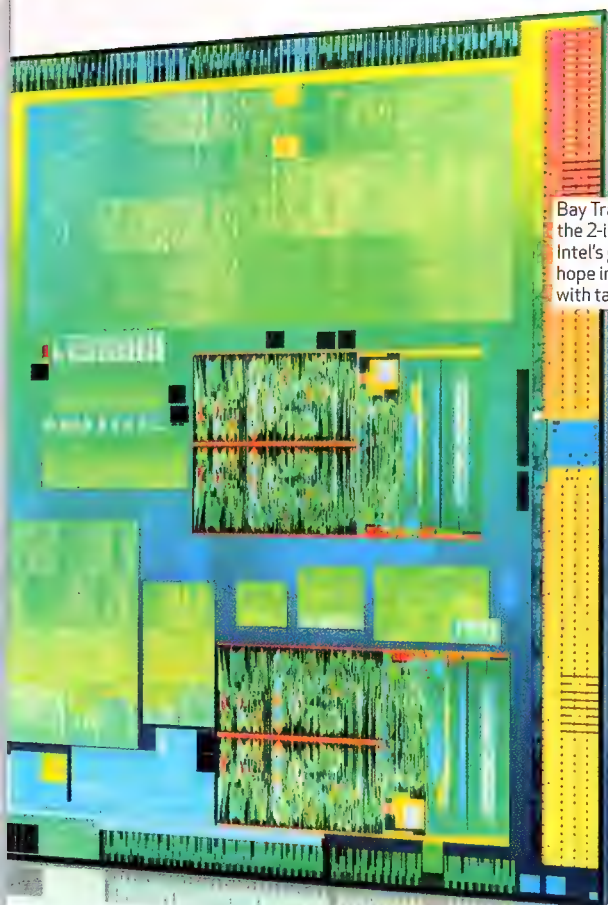
ASUS' impressive-looking T100 is the poster child of this new wave of computing, offering a Bay Trail-powered tablet when you need it and a robust keyboard/trackpad you can attach to it when you need to get something done. It's got a relatively small 10.1-inch 1,366 x 768 IPS screen, 11 hours of battery life, USB 3.0 and a full version of Windows 8. The local price tag of \$600 is a bit rich though, considering the US\$350 price overseas.

Like the ultrabooks, there's a minimum spec for the new gen 2-in-1s, which ought to ensure the low-end of the market doesn't mess things up for the rest. Kirk Skaugen, senior vice-president of Intel's Client Group, explained that they need to have "screen sizes that don't compromise the productivity of a laptop" and a full operating system. "Not Windows RT," he went on. "To give you the full x86 compatibility that the PC industry is known to love." There are other requirements, too, such as touch responsiveness around the 200ms mark, quick boot times and full-day (at least nine-hour) battery life.

Thankfully, this year's IDF wasn't focused purely on tablets and low-end laptops; there was a host of other techie discussion

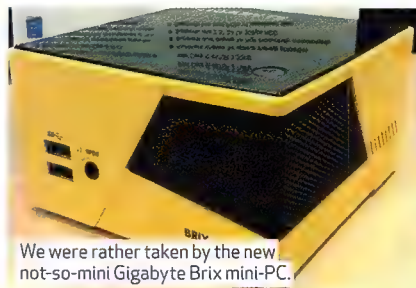


DDR4: coming soon to a PC near you... or not...

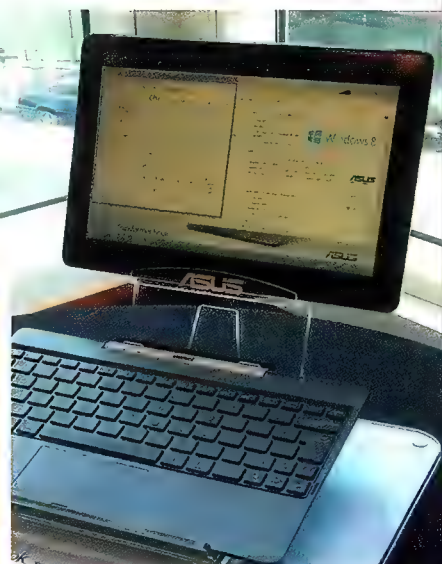


Bay Trail: powering the 2-in-1 market – Intel's great white hope in the battle with tablets.

The mightily impressive ASUS T100. Shame about the local price though.



We were rather taken by the new not-so-mini Gigabyte Brix mini-PC.



and introductions to new goodies. One of the neatest was in the Tech Showcase, where Gigabyte was showing off the next generation Brix mini-PC. It's bigger than the one we reviewed a few months back, but that's OK because it's running the latest Iris Pro-powered CPUs in i3, i5 or i7 trim.

The top-end Intel graphics aren't going to challenge your desktop gaming rig, but the tiny form factor and mainstream gaming capabilities make them pretty decent options for linking up to your TV in the lounge room. And they'd make pretty impressive Steam boxes, too... the problem remains one of pricing, however. They're going to be attaching a premium because of the form factor, which is likely to make them a pretty tough sell.

DISTANT MEMORY

We also saw our first DDR4 modules – and possibly our last, too. The memory folk Intel included were desperate to impart to attendees that DDR4 was indeed real, but it seems increasingly unlikely to make its way into our home PCs for many years. We spoke to a Kingston representative on the show floor, who expected DDR4 to appear in consumers' machines a year after servers. And with those getting DDR4 next year, that would put it in desktops sometime in 2015. A Samsung rep though, couldn't see it making the transition until well after that date.

Intel also showed off some

neat new overclocking tech. The quick SSD overclocking demo showed a 10 per cent performance boost via an AS SSD benchmark from a 225MHz overclock to the solid state drive's memory controller. At the moment, it's a lab experiment, but the implementation came through the impressive Extreme Tuning Utility (XTU). There are a host of monitors on the controller that should call a halt to proceedings if it looks as if the overclock is unduly stressing the NAND chips, but the touted NAND chip overclocking looks much more fraught with data-killing danger. (See page 7 for more on Intel's SSD overclocking tech.)

But the XTU also has a new friend in hwbot.org. The overclocking community is being integrated directly into Intel's

XTU, thanks to the new AppTune beta – an extension that allows dynamic per-application CPU overclocking via the software.

You can specify different OC profiles tagged to specific programs, and when XTU sees an app being launched it will automatically apply whatever overclock you've designated for that program. It means you'll no longer need your CPU cooking at 4.4GHz when you're browsing, just waiting for you to launch that processor-intensive app. It ought to save casual overclockers a fair bit of energy and a chunk of CPU wear and tear, too.

So, while it might turn out to be the last IDF we get invited to, as the company focuses more on the mobility side, it was still a packed show, and one which gave us great hope for the future of the PC.

Broadwellian benchmarks

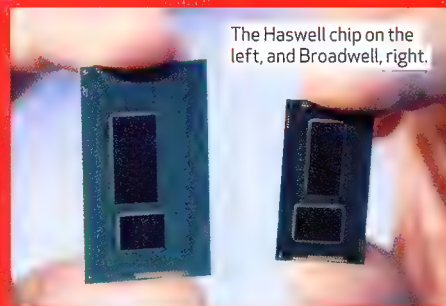
It's not all about mobile – we take a sneaky peek at 14nm in action.

Our high-end PCs may not have been the focus of this year's IDF, but that didn't mean we weren't represented. While he was spending much of the energy extolling the virtues of mobility, and the Bay Trail SoC (in particular Brian Krzanich (or 'BK' as the Intel engineers kept calling him) took time out to show off a finished and functional Broadwell chip.

"This is it, folks," exclaimed Krzanich. "14nm is here. It's working and we'll be shipping by the end of this year. That puts it right on schedule, and we'll see it actually out in the wild – hopefully – in the spring of 2014."

Kirk Skaugen, though, was happy to upstage his CEO and went further than simply holding up a bit of silicon. "I can show you the benefits of what 14nm is already delivering without a lot of tuning," said Skaugen.

He had a Broadwell system running side-by-side with a Haswell machine, running the familiar Cinebench benchmark. He wouldn't divulge the final index score of the four-threaded Broadwell SoC, but did show that even under load it was running at under 50W. The Haswell SoC



The Haswell chip on the left, and Broadwell, right.

as the other hand, was hitting almost 70W. That said, if power reduction scales up to the desktop parts, the 14nm Broadwell CPUs should have a fair amount of performance overhead to play with.

I spoke with John Webb, graphics marketing manager at Intel, about what the move to 14nm could mean for performance. "Whenever you go to a new process capability, you get area improvements or you can get power improvements," he explained. "So you may choose to say 'I want the same performance but I want less power, or you can play it the other way and say 'I have more space, I want the same power but put down more area and get maybe 39 per cent better game performance'."

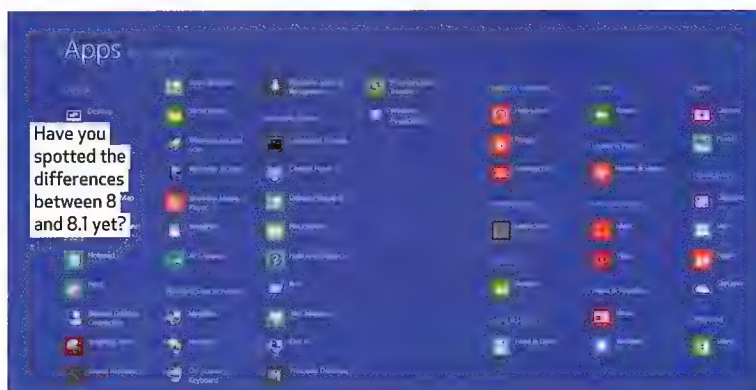
We know which we'll choose for the desktop. ■

technotes

» EPINIONS

Reader's letters

APC readers sound off on the latest tech issues.



WIN 8.1 TIPS

Just a couple of items I noticed in Windows 8.1 Pro that your readers might be interested in. In File History the Recovery Disk must now be USB Flash Drive — the CD/DVD option in Windows 8 (made available by removing all USB Flash Drives) is no longer available. Moreover the USB Flash Drive must be re-formatted as NTFS (which you cannot do in Windows XP). Also you cannot write a System Image to DVD.

Previously under Windows 8 to name a group of tiles you clicked on the 'v' bar on the bottom right of the screen then selected 'Name Group'. Now under Windows 8.1 you right-click on any tile and the Group Name entry box appears in which you can type a name and hit Enter. This raises another point that it would be nice to hide groups so that only your main app group appeared. This would then require a dropdown list of Groups to be selectable near the Start button so that you could select groups to appear. Maybe Microsoft might implement this in Windows 9? Spencer Smith

NEW LOOK

I am in my third year of an APC subscription and in the last two years

I have been noticing changes to the magazine both good and bad. I have liked some of the redesign aspects of it including the new form factor of the November issue. One change I don't agree with is the disc. I have collected all of my APC magazines and discs on my bookshelf in perfect condition and this month's disc has come in a paper case instead of the usual plastic case.

Another thing that's new is that you are using stars ratings instead of numbers. You have improved the ratings giving several new ones for features, performance and value but I find that stars are not as effective in rating as numbers and it makes it look gimmicky.

One thing that I would love to see more of is the Master Builder section.

I look forward to another year of APC and some good changes to come. Quentin Lovett

Ed replies: We're glad you like most of the new look APC, the content is still the same in-depth coverage as before, with just a lick of paint to spruce it up a bit. In the facelift, Master Builder has been moved up the back into our Masterclass section and been renamed to PC Builder. It will make a return in our January issue next month.



One reader needs your help to stop his tablet battery draining at a phenomenal rate.

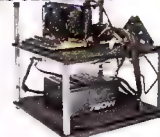
DRAINED

Last year I purchased a Samsung Galaxy Tab II 7.0. I could use it for a couple of days without needing recharging, but several weeks ago I updated to Jelly Bean 4.2.2, and suddenly the battery life drains like water in the shower. I've tried disabling all the features of Google Now, turning GPS and other internet connected apps off, but that barely made a difference. I looked at the System Settings Battery Data, and it says that 90% of the power is being used by Android OS, and the rest is internet. I'm wondering if any of your readers know what could be causing the sudden battery life drop and how can I solve the problem?

Zach Manson ■

Looking for Master Builder? It's now more in-depth and lives in our Masterclass section.

masterclass



The basics of an open-air test bench

Tom McNamee

When it comes to building a test bench, there are a few things you need to know. First, you need a good power supply. Second, you need a good motherboard. Third, you need a good CPU. Fourth, you need a good GPU. Fifth, you need a good RAM. Sixth, you need a good storage. Seventh, you need a good network. Eighth, you need a good cooling. Ninth, you need a good case. Tenth, you need a good monitor. Eleventh, you need a good keyboard. Twelfth, you need a good mouse. Thirteenth, you need a good headset. Fourteenth, you need a good chair. Fifteenth, you need a good desk. Sixteenth, you need a good room. Seventeenth, you need a good time. Eighteenth, you need a good budget. Nineteenth, you need a good plan. Twentieth, you need a good result.



The basics of an open-air test bench



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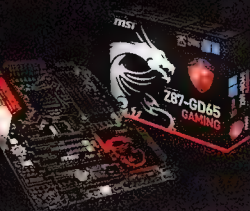
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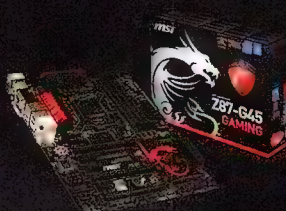
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» END USER

Megaupload's mega-take-down

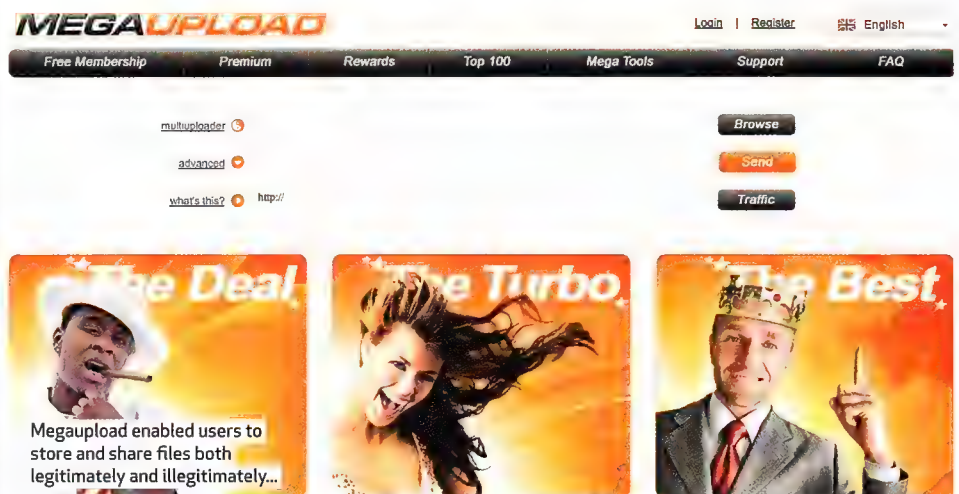
The most sweeping mass file destruction in history serves as a reminder of the importance of keeping a local backup of your cloud data.

The continuing saga of Kim Dotcom's 'Megaupload' empire and its staggered downfall is perhaps only rivalled in the soap opera stakes by the strange-but-true adventures of security software pioneer John McAfee, whose latest stunt is an upcoming US\$100 gadget he claims will block the NSA from spying on you.

But back to Kim Dotcom. When the US government raided the storage svengali's New Zealand mansion in January 2012 with the help of the NZ police, they charged Dotcom with being the ringleader of an "international organised criminal enterprise allegedly responsible for massive worldwide online piracy, causing more than half a billion dollars in harm to copyright owners."

In concert with numerous arrests, the US Justice Department abruptly shut down Megaupload, Dotcom's hugely popular online file storage service — estimated at one time to be the 13th most popular site on the web and sucking up some 4% of all internet traffic — with most of the activity allegedly constituting illegal file sharing between Megaupload's 150 million users.

As soon as Megaupload was taken offline, the uproar began. While the condemnations of the freeloader community might not have carried much validity (it was, after all, their actions that gave the authorities cause to act), a huge and righteous clamour was raised by Megaupload's 'legitimate' users: the vast number of people who complained that they used Megaupload for non-copyright-infringing purposes, as a regular



file storage service for personal and professional data. Without notice, these users had been cut off from their files by a unilateral decision of the US Justice Department, who digitally quarantined all of Megaupload's data in one fell swoop.

But just how much of Megaupload's data really was legit? Kim Dotcom's crew always maintained that the majority of Megaupload's traffic was legitimate, yet there was no way of knowing for sure. Until now, that is. According to an academic study jointly conducted by Boston's Northeastern University, France's INRIA and Australia's NICTA research institutes, the amount of legitimate personal data lost was significant, even staggering.

While acknowledging that limitations with the precision of their heuristics methodology prevented them from identifying the legitimacy of a large percentage

...until it got seized by the Feds, resulting in the immediate removal of more than 10 million legitimate files, according to a new study.

of data uploaded to one-click file hosters (OCHs), the researchers concluded that, at a bare minimum, in the most conservative scenario, at least 4.3% of the files hosted on Megaupload at the time of its closure indicated legitimacy. While this might seem small, it still equates to 10.75 million lost legitimate files.

Regardless of your opinion of Kim Dotcom and Megaupload's primary incentives and *raison d'être*, there's no denying a huge number of people lost important personal data through no fault of their own. As yet, there's no indication whether the US government will ever consider letting those users have it back.

It's a rather dramatic story that's a reminder of a mundane, but important, truth. Always keep multiple backups: at least one off-site if you can, but don't forget about a local backup too. Because sometimes in the cloud it rains. ■

ENDUSER

Share the hilarity!

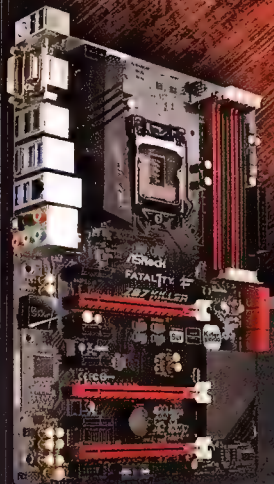
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technotes

» HOW IT'S DONE

1 Beware of the adhesive tape securing the screen to the backing, it's tough to remove.

2 They're not high quality, but the modular speakers pop out of the build quite easily.

3 You'll find the fan is a breeze to replace... (sorry).

4 Secured with magnets, so easy to remove, the 'shield' is crying out for some customised stencil work.

5 The three Sanyo battery cells explain why the Shield has such a long battery life.

Nvidia Shield

The jury is still out on what this actually is. Is it a gamepad? Perhaps a tablet? Or is it a console instead?

BACKGROUND

We're still not sure if Nvidia's Shield is an awesome gaming tablet, or an awesome tableting game console. But now, we do at least know what it looks like naked.

MAJOR TECH SPECS

- Nvidia Tegra 4 quad-core mobile processor
- 5-inch 1280 x 720-pixel multitouch, retinal-quality display
- 16GB flash memory with microSD slot
- 2GB RAM
- 802.11n 2x2 MIMO Wi-Fi
- Bluetooth 3.0
- Android Jelly Bean OS

KEY FINDINGS

- After loosening a few screws around the base, we're treated to the Shield's interior, which looks nothing like any tablet we've ever taken apart... or game console... or anything.

- The flick of a spudger and a few connectors are all that you need for button-panel-assembly disassembly. We love the modularity of this design. If our button mashing gets out of control, we're happy to know the button board can be replaced separately from other components.
- Next out are the speakers, which are also modular.
- We're able to spudger the forward antenna array off of the battery to free it up. After some fussing, we remove three Sanyo battery cells. A small circuit board connecting them is most likely a charging control circuit.
- The Shield's fan is a breeze to replace — it contains no screws, and its bumpers simply fit into slots on the midframe.
- After removing some screws, we eventually lift out the midframe, revealing a display cable with a fancy connector board. And after 10 minutes of mild terror with a spudger, the display is free of

the tape adhering it to its casing. On the back of display we find a few antennas, a single IC, and a display cable.

- The last components to come out of the body are the motherboard and the heatsink.
- The silver shield atop the Shield is its own piece, secured to the device by magnets. Easily removed means easily modified — we expect to see some awesome stenciled-up Shields.

REPAIRABILITY SCORE: 6 OUT OF 10

Modular design means lower repair costs, because small parts can be replaced individually. But a complicated interior design makes repair and reassembly difficult. Also, while the hinge seems sturdy, stubborn adhesive makes display repair risky, and involved disassembly makes removal difficult. The battery is not easily accessible, and will require some tricky disassembly to replace. ■

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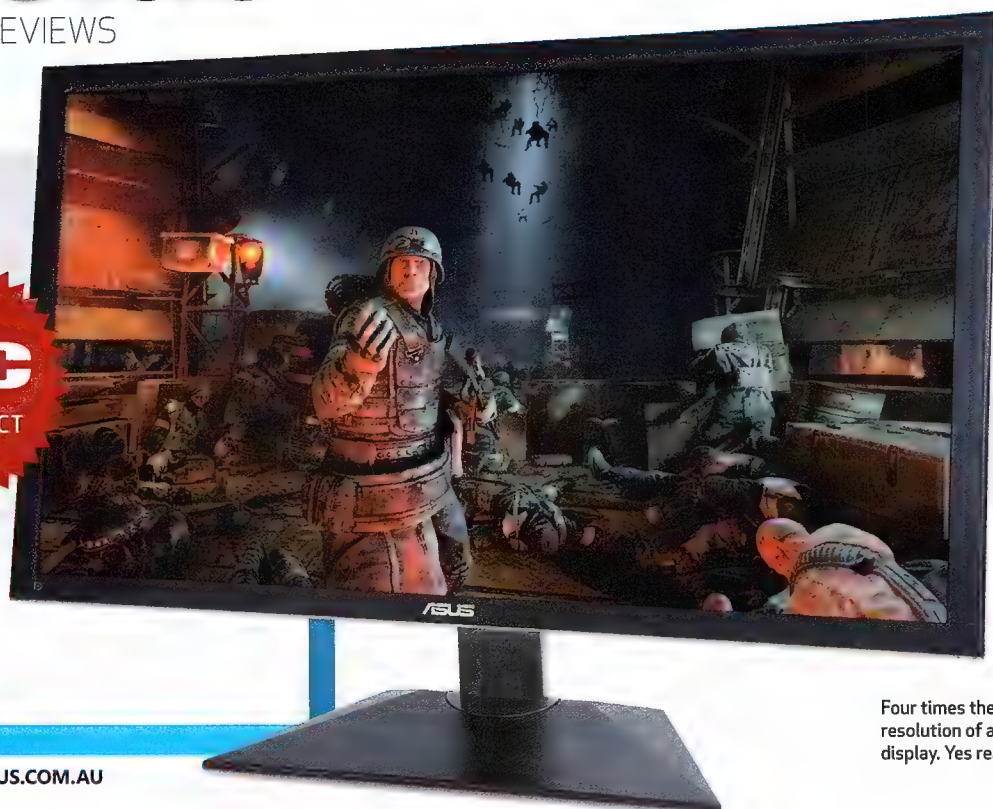
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» LATEST REVIEWS



Four times the resolution of a 1080p display. Yes really.

MONITOR

\$4,599 | WWW.ASUS.COM.AU

ASUS PQ321Q

The 4K future is here... but it'll cost ya.

Thirty inches. 2,560 x 1,600 grid. Four million pixels. That was the gold standard in PC displays. But it's just been blown away. Welcome to the wonderful world of ultra-high-definition visuals.

With this outrageous \$4,599 flatscreen, ASUS is giving us our first taste of 4K resolutions. It might just be the next big thing in PC graphics. Can it possibly live up to the hype?

Let's not get ahead of ourselves, here. Regular APCers among you will know we've been a bit down on high-end PC hardware in the past. On the CPU side, for instance, Intel's been sandbagging on an epic scale. Recently, we've had the new Core i7-4960X — such a spectacularly incremental step forward, it's a bit like adding a seat to a single train carriage on the Western Sydney Line and then firing out a triumphant press release claiming increases in national public transport capacity.

Then there's graphics. AMD

and Nvidia have at least been keeping each other honest on the performance side. That includes a brand new flagship GPU from AMD, which should be hitting shelves *en masse* by the time you read this.

The problem is, AMD and Nvidia have somehow colluded to keep graphics prices painfully high. It wasn't that long ago when AMD led us to believe \$600 was the limit for high-end graphics. It didn't last. So, that's the context for the arrival of this new hyper-spec screen from ASUS. It's the largest true PC monitor we've seen, at 31.5 inches in diagonal, and at just \$1 short of \$4,600 it's also the most expensive. It's therefore tricky to immediately take the ASUS PQ321QE too seriously.

If we're fed up with \$600-plus graphics cards, what are we supposed to make of a \$4,600 screen? Here's the thing. This panel is so exceptional, so spectacular, that it demands your attention at any price.

The big news, of course, is the

3,840 x 2,160 pixel grid. Strictly speaking, it's not quite 4K (or 4,000 horizontal pixels), but it's close enough not to make a material difference to the viewing experience. It's made possible by indium gallium zinc oxide (IGZO) technology, which takes the place of amorphous silicon in standard TFT LCD panels and allows for smaller pixels while maintaining light transmission. In other words, you can have really high resolutions without losing any brightness.

FOUR IN HAND

Anyway, it's precisely four times the resolution of a 1080p full-HD panel. In some quarters, this four-times metric has caused some consternation. After all, it's only double the horizontal and vertical pixels.

If you're in doubt, the best way to think about it goes like this. Take a 1,920 x 1,080 full HD pixel grid and super impose it top left on the ASUS's 3,840 x 2,160 grid. It'll stretch halfway across and halfway down.

Then stick another 1,920 x 1,080 on the right. You've covered half the screen. Add two more below, and bang — four 1080p grids and four times the resolution. As Blackadder said, even the ape creatures of the Indus have grasped this.

Advanced mathematics aside, what follows is all manner of goodness. First is general sharpness and image quality. You may be used to seeing high DPI and tight pixel pitches on your mobile devices, but experiencing it on a screen of this scale is truly spectacular.

Admittedly, mobile devices still trump the ASUS PQ321QE for sheer pixel density. The ASUS sports pixels measuring 0.182mm across, whereas an iPhone 5s's pixels are less than half as big — just 0.07815mm across — but the initial impression is still of staggering clarity and sharpness, the likes of which you've never seen before in a desktop display.

Next up is screen real estate — a metric tonne of it. We're accustomed to using 2,560 x

1,440 27-inchers and 2,560 x 1,600 30-inchers. But this thing blows them away. Yup, somebody has finally come up with a panel that makes those existing high-res panels feel cramped.

The inherent quality of the panel is outrageously good, too. If you've been wondering why not many monitor-makers bother with PVA tech these days, this panel comes along and gives that oft-overlooked panel type a much needed shot in the arm. It matches or bests the top panels out there for contrast, viewing angles, saturation and black levels, for starters. Then it blows them away with far superior colour accuracy and zippy response, free from overdrive-related nasties such as inverse ghosting. It's also worth noting that there's not a whiff of IPS glow and the anti-glare coating is smooth and sparkle-free.

HIGHER THAN HIGH

Our next port of call is video quality. What's really interesting here is that high definition video is typically pegged at 1,920 x 1,080 pixels. That's currently Full HD, and it's what all our brains are tuned to, so when you fire up some 4K content (there are demo streams on YouTube, among other sources), the results are spectacular. It genuinely feels like looking through a window into an alternative reality – one that's as sharp as the real world, but brighter and more vibrant. Move over stereoscopic 3D; this is where it's really at.

When it comes to games, however, the step up isn't quite so dramatic. The reason for that, of course, is that we're accustomed to seeing games rendered at true 2,560 x 1,440, or 1,600 on similar-sized panels. At 3,840 x 2,160, the ASUS PQ321QE does look tangibly better – it's nothing less than superb – but if you're used to existing beyond-1080p panels, it's not quite a life-altering improvement.

HEAVY LOAD

The bottom line is that the ASUS PQ321QE looks utterly sublime, but there are issues, and we're not just talking about the 4,599 problems denominated in dollars. The first is the monumental load that 3,840 x 2,160 pixels puts on

a graphics chip. Do the sums and we are talking about in excess of eight million pixels on this panel. Ideally, you'd want those pixels updated at a rate of at least 30 times a second – preferably faster.

Net result? Your GPU has to process and then pump out roughly 250 million pixels per second. It's a number that's almost beyond comprehension, and it says a lot about modern graphics tech that it is actually doable. In all but one of our game benchmarks, a pair of Nvidia Titans managed to deliver an average frame rate of 30fps (OK, 29fps) or higher. A pair of AMD Radeon HD 7970 GHz cards can make the same claim, even if it's *Sleeping Dogs* rather than *Company of Heroes 2* where the Radeons fall down.

A significant investment in GPU hardware, then, for what would normally be considered marginal frame rates, but if you're dropping \$4,599 on a panel, \$2,300 for a pair of Titans or \$1,500 on some Radeons is hardly unreasonable. What you really want to know is, can you get playable frame rates at super high settings? The answer is: it's borderline. We're really comfortable with the performance of even two Titans at this resolution. At least you know things will get better as new GPUs appear.

LOVE HERTZ

The final problem is more of a generic question of 2D support for such a huge resolution. It's beyond what DVI can handle, even in dual-link format, so that's out. A single HDMI connection, using the latest spec, can handle the 3,840 x 2,160 resolution, but only at 30Hz refresh. Take it from us, 30Hz is fugly. You need to run this panel at 60Hz.

In theory, you can drive it at 60Hz using dual-HDMI connections, but real-world support for that configuration seems patchy. Thus, your main option is DisplayPort. You'll still need to run the display in what's known as multi-stream mode (MST), rather

than single-stream mode (SST). The technicalities are a bit complicated, but MST boils down to a halfway house between a true single pixel grid and running the screen as a pair of virtual displays.

The key thing with MST is that it shows up as one display to the operating system and applications – most critically, games. The problem is that it's not fully compatible with rendering prior to graphics driver loading. That means things such as BIOS screens, Windows Safe Mode and all that jazz. Your mileage will vary depending on the video card. With some, the screen is blank during boot. With others, you'll get the BIOS squished into one half of the display, which is at least usable.

The bottom line is, you'll have to switch modes in the PQ321QE's OSD to guarantee you're seeing things right outside of a fully drivered-up Windows OS, which you won't



enjoy doing because the OSD controls are placed carefully to make them almost impossible to use comfortably.

This is the new de facto measure for all other screens. OK, hardly anyone will buy this screen, and we do wonder why it's so expensive (the first 30-inch 2,560 x 1,600 panels were half this price when they appeared around eight years ago), but for the time being, this monitor is as good as it gets. Well, until someone cooks up a lovely 4K 120Hz panel that is...

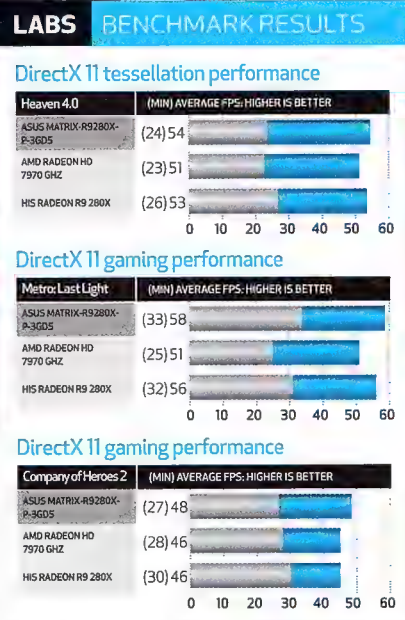
■ Jeremy Laird

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Forget stereoscopic 3D, it's 4K that's the next big thing in PC visuals. This early take from ASUS is awesome but it's too pricey.





GPU
\$469 | WWW.ASUS.COM.AU

ASUS MATRIX-R9280X-P-3GD5

Full-featured with great performance, but expect to pay for it.

On your mark. Get set. Rebadge! Yup, AMD and Nvidia seem to be having a race to see who can rebadge the most graphics chipsets in the shortest time.

Earlier this year, Nvidia launched a whole new family of GeForce GTX 700 series high-performance GPUs. Except none of them were actually new. They were either straight rebadging efforts or, at most, existing chips mildly tweaked. And then rebadged.

Now it seems AMD is at it, too. While there are a couple of new GPUs in this new range, in the form of the R9 290X and the R9 290, the other GPUs that have just been released are simply rebadged GPUs from the 7000 family.

That includes the R9 280X GPU at the heart of this card from ASUS. What we have here is AMD's Tahiti XTL GPU, which is simply a respin of the Tahiti GPU that can be

found in the Radeon HD 7950 and 7970. To all intents and purposes the new R9 280X is identical to the outgoing Radeon HD 7970.

That means 2,048 shaders, 128 textures, 32 ROPs, yada yada... only the clockspeed seems to be any different, which is officially defined as up to 1GHz. Except not in the case of this ASUS take on the new 280X. The Platinum Edition boards rock up at 1,100MHz, 10 per cent faster than the reference design.

OK, that may not seem that dramatic, not by CPU overclocking standards. But this is a GPU, and in that context 10 per cent is actually quite a bump. Anyway, there's more than just a clockspeed boost to perve over here, like the monumental triple-spot cooling solution. Then there's the VGA Hotwire feature that allows direct overvolting of the GPU, and TweakIt buttons that allow said overvolting to be finessed with a poke of a finger. Clever stuff.

There's even a safe mode switch that brings everything back to stable defaults. Oh, and Japanese black metallic capacitors all round. At which point, this is all beginning to sound like a high-end motherboard review. And that's kind of how ASUS is pitching its Matrix series of graphics cards; it's all about tweakability and the quality of the components.

The final feature of note involves video outputs. You get a pair of DVI ports and no fewer than four DisplayPort sockets. There's full 4K support, though — as you can read elsewhere in this issue — 4K panels demand massive GPU performance.

As good as the 280X chipset is, it's not quite brilliant. And for the most part, there are no performance surprises. The Matrix Platinum kicks out the kind of numbers you'd expect from a Radeon HD 7970 GHz-and-a-bit edition. Which is what this board really is.

There's still no shame in that, but new branding does generate expectations of something novel and on the chipset side there's nothing. That's not ASUS's fault, of course. But there's the rub: the one good thing that usually comes with this kind of rebrand is a price drop. In other words, the main appeal of the Radeon R9 280X will be to give you a 7970 GHz for less cash. But that's the opposite of what ASUS is offering with this premium, overclocked board. Given R9 280Xs start at \$375, this is a bit too costly.

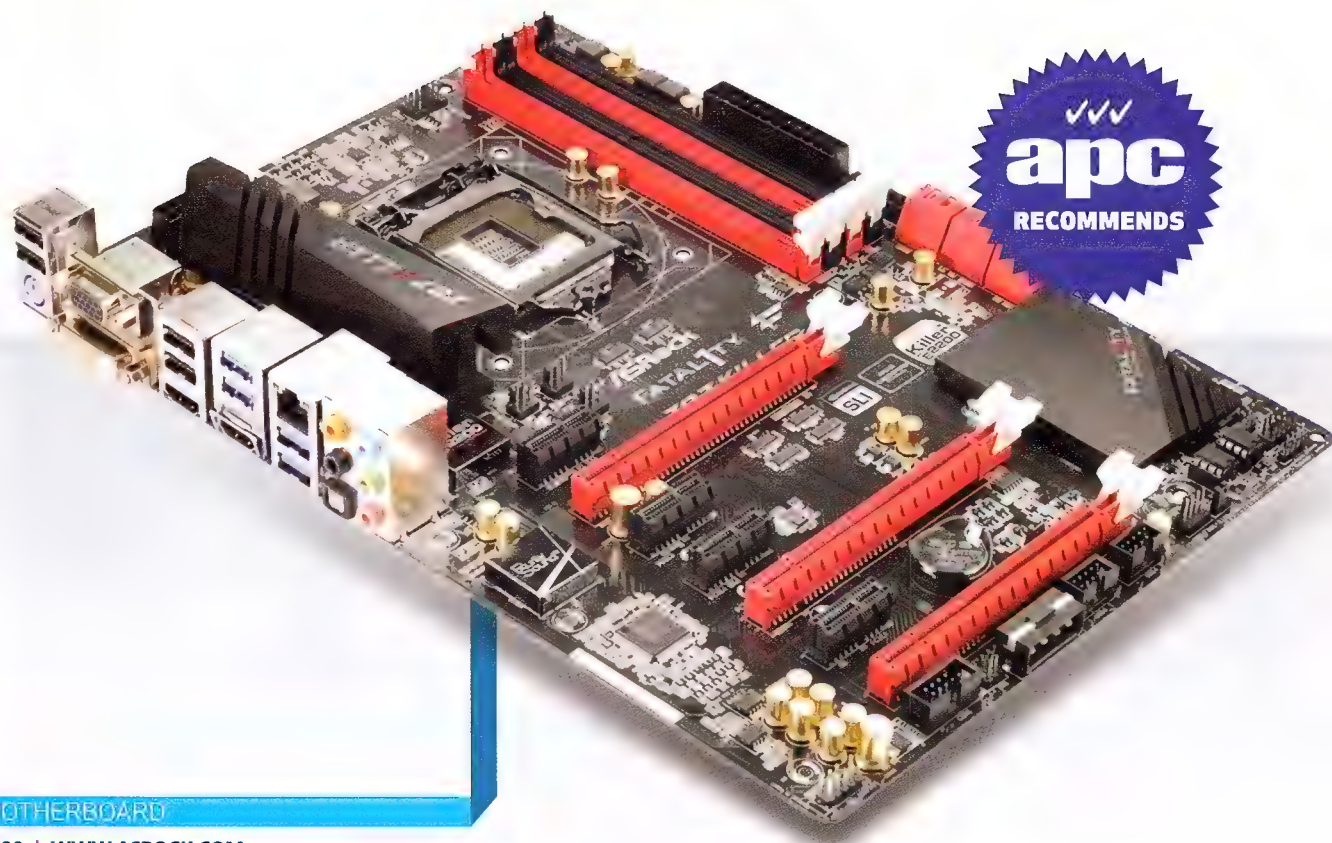
■ Ben Andrews

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

An awesome feature set. We're just not sure how many people want to overvolt their GPU. Or pay through the nose to do so.





MOTHERBOARD

\$200 | WWW.ASROCK.COM

ASROCK FATALITY Z87 KILLER

ASRock takes the Fatalty series to the next level.

ASRock has been gaining traction in the Australia PC building community over the past few years. From entry-level offerings right up to its flagship OC Formula boards, ASRock has managed to secure third place in the enthusiast motherboard market, putting it right behind ASUS and Gigabyte.

The latest offering in the company's Fatalty series is the Z87 Killer and, as with the rest of the family, it's a board engineered with gaming in mind. Featuring a black and red design that's eerily reminiscent of ASUS's Republic of Gamers range, this is undeniably a good-looking board. Gold capacitors pop beautifully against the black PCB, giving the board a touch of elegance while maintaining a sharp, high performance feel. We did find, however, that the heat sink covering the power delivery components is not adequately secured, allowing it to easily bend sideways when touched

and preventing optimal heat transfer.

Backing up those good looks is a sensible layout; three x16 PCIe slots are supported by four x1 slots, this allows up to three-way AMD CrossFire and Nvidia SLI support. Also on board is the normal assortment of VGA, HDMI and DVI ports as well as six SATA 6Gbps ports and a total of 14 USB ports, eight of them on the I/O shield, six via expansion sockets. An eight-phase power delivery has more than enough power to drive the latest Intel Haswell CPUs; in fact, the included digital PWM is significantly over-engineered. This helps to reduce the stress on the components and should result in a longer lifetime for the motherboard. ASRock has stepped the board up to the next level with a range of gaming features, too. First up, the Fatalty mouse port provides gamers mouse polling adjustments between 125Hz and 1,000Hz depending on the mouse attached.

Next is the Qualcomm E2201 Killer Ethernet adapter, which when paired with the Killer Network Manager software, can deliver lower latency by applying application-level Quality of Service. This means potentially decreased ping times and increased efficiency for your favourite online games. The last piece of the gaming puzzle is what ASRock calls its 'Purity audio system', featuring a Realtek ALC1150 chip, differential and heat-set amplifiers and PCB-isolated shielding.

Across all benchmarks the Killer was impressive in performance testing. In the *Street Fighter IV* benchmark the performance was just average, but in both memory bandwidth and SuperPI the Killer was as good as we've seen, matching top of the line boards from competitors. We did however find lower than average performance across a range of synthetic 3D benchmarks, though only to the tune of around 1.5%.

While the Killer is a strong board for a very good price, it doesn't quite blow our socks off. That could be because it rips off the ASUS colour scheme and Gigabytes G1 gaming range for features, but it just isn't an inspiring board. If you're looking for an innovative and inspirational gaming product with all the bells and whistles, then this isn't quite the board for you. If you want a well-rounded gaming board that's both inexpensive and adequately featured, then the ASRock Fatalty Z87 killer should have everything you need. ■

James Trevaskis

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

The Z87 Killer is a competitively priced and well rounded package, but it's one that does feel a little cheap and flimsy in parts.



✓✓✓
apc
RECOMMENDS



CASE

\$210 | WWW.CORSAIR.COM

CORSAIR OBSIDIAN 750D

Corsair's monolithic flagship gets cut down a size.

Corsair's new 750D is the smaller version of the company's well-regarded (but frankly gigantic) Obsidian 900D, a super-tower enthusiast case with features and options out the whazoo. That's not to imply that the 750D is actually small, however — this is still a full tower capable of fitting a buttload of parts.

It uses a distinctive but understated industrial design, that matches a steel frame with a brushed-aluminium front face and a clear plastic side window. It keeps a similar layout and design to its sibling; this is one of the most open, clean designs you'll find in a full tower and while there's plenty of breathing space inside, the 750D still has room for six 3.5-inch and four 2.5-inch drives. It's also incredibly builder-friendly. All drive bays are tool free and the 3.5-inch caddies can be mounted side-by-side or stacked on top of each other. There's a CPU cut-out to allow for easy swapping of coolers that would

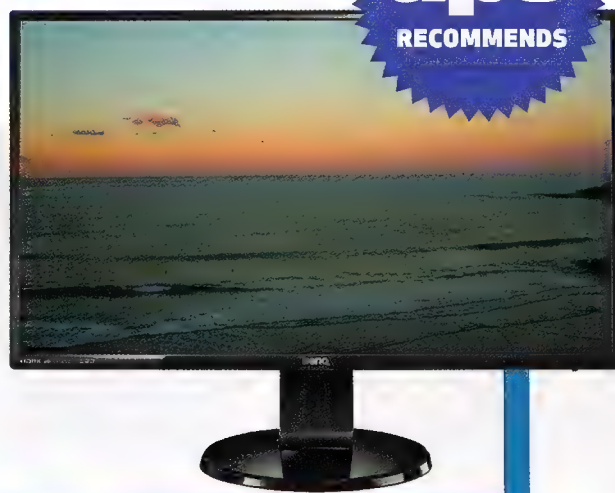
usually require removing your whole motherboard. And once you've got your build in place, ventilation won't be a problem. In addition to shipping with three 140mm fans (two intake behind the front face, one exhaust in the rear) there's space for a 360mm water-cooler radiator and the case's distinctive angled feet help elevate it off the floor and, if you've mounted an optional bottom fan or two, will let cool air be drawn in more easily. In fact, our only complaint is that the 750D is perhaps a little too open; if you're after a case with sound-dampening, there are better options. That gripe aside, this is a great case to work with and one that gives your components plenty of room to breathe. ■ **Dan Gardiner**

Verdict

The 750D manages to bring all the best bits of its larger sibling into a (slightly) smaller package.



✓✓✓
apc
RECOMMENDS



MONITOR

\$300 | WWW.BENQ.COM.AU

BENQ GW2760HS

A big, stylish and affordable monitor that's better for your eyes. What's the catch?

Large-format displays are now easily within the reach of those on a budget, and the quality is going up. Take BenQ's slim GW2760HS. At the time of writing, it's around \$300 on the street, but it's packed with features and puts in a performance we couldn't have expected from a low-cost monitor a few years ago. It's surprisingly feature-rich for a budget-priced display.

Preset calibrations include a Reading Mode, which sets the monitor's colour temperature, brightness, contrast ratio and sharpness to mimic the paper used in paperbacks; much more comfortable for reading your ebooks. It's also the first in BenQ's new range of Eye-Care monitors, featuring a flicker-free backlight to reduce eye strain and headaches.

In our gradients test, colour ramps were smooth and consistent, without

banding. It did an excellent job of distinguishing between black and near-black, and white and almost-white, too. Viewing angles are impressive, and the flicker-free backlight makes it easier on the eyes for prolonged use. Text reproduction is acceptable.

Although it measures up well against other monitors in this price range, it lacks the clarity offered by more expensive screens. There are some areas where this low-cost display can't compete with its more expensive rivals, but overall it puts in a performance that belies its price. ■ **Ian Osborne**

Verdict

A capable and feature-rich display that certainly doesn't disappoint. Very good value for money.





WIRELESS ROUTER

\$290 | WWW.ASUS.COM/AU

ASUS RT-AC68U

An ace example of how to do 802.11ac.

ASUS pitches this RT-AC68U as the “worlds fastest router”, a claim based on its combined 802.11ac Wi-Fi transfer speeds of 1300Mbps/600Mbps (on the 5GHz and 2.4GHz bands respectively). That’s a somewhat wobbly declaration, as you’ll need very specific hardware to get those top speeds, but thankfully, that doesn’t really take away from what this router is at heart: a pretty snazzy enthusiast-pitched product.

ASUS has become quite good at building networking gear over the last few years. In this new model, they’ve bundled in enough advanced features to make the most hardcore networking junkies happy, including traffic prioritisation and real-time monitoring (who doesn’t love charts!), isolated guest networks (you can have up to six, each with different access settings), two USB ports that’ll let you plug in a 3G/4G backup modem or

host a USB printer or storage device (and you can even use that storage device as an FTP), and an ASUS AiCloud app for iOS and Android devices that lets you access your local network shares (and even wake up sleeping PCs via wake-on-LAN) while you’re out and about. As with DD-WRT, you can also dig into some quite advanced wireless settings, such as adjusting transmission strength or turn the wireless on and off based on a schedule. In fact, about the only thing missing is that there’s no web site blocking functionality in the ‘Parental control’ area — this just lets you restrict access to certain hours of the day for specific machines.

So what about those speed claims? The RT-AC68U is fast but, as with all things wireless, your mileage will definitely vary depending on your set up. We tested the RT-AC68U paired with ASUS’s PCE-68U adapter (a PCI Express 802.11ac wireless card), putting them up against a similarly-specced

Linksys EA6500 router and WUMC710 wireless switch (attached to our test PC via Gigabit Ethernet). They were ultimately closely matched, with identical average receive speeds (221Mbps) and transmit speeds of 175Mbps (ASUS) and 195Mbps (Linksys). That might seem to place Linksys in front, but we performed each test five times, and the ASUS’s variance was only in the range of 5-10%, whereas the Linksys gear had some very sharp jumps (both up and down), more than doubling its transfer speeds from best to worst. For us, we’d prefer consistency over that slight performance increase.

With a router this feature-packed it’s little wonder there are some bugs to contend with. We encountered a handful of minor problems during testing, such as certain elements of the Instagram app not updating on any of our Android phones when connected to the RT-AC68U. The front LEDs can be turned off using a hardware button, but they switch back

on after a reset, no matter what position that button is in. And finally the real-time traffic monitor didn’t measure outgoing traffic correctly unless traffic prioritisation was turned on; without the latter, it just mirrored the incoming readings (and last time we checked, our 1Mbps-upload ADSL connection wasn’t capable of 17Mbps transfers).

Once ASUS sorts out those few bugs, this will be a pretty killer enthusiast router. If you’re shopping for a future-proof 802.11ac router, then this one should definitely be on your list. ■ **Dan Gardiner**

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

World’s fastest or not, the RT-AC68U is a fantastically feature-packed 802.11ac router.





NAS BOX

\$180 | BUFFALO-TECHNOLOGY.COM

BUFFALO LINKSTATION 421

Elegant, yes, but is this the ideal way to store your files on a network?

This two-bay network-attached storage (NAS) box comes ready for you to fit two 3.5in hard disks.

Screwing them into the sleds takes minutes, but since the drives can't be locked in place, the LinkStation is probably best suited to home use. In testing, the pattern of flashing lights during setup also didn't match expectations from Buffalo's guide – that made for a nerve-wracking ten-minute wait to discover the disks were indeed correctly configured. The disks can be set up to work independently, be mirrored for insurance, or striped for speed. The 421's USB ports can be used to share a printer as well as to expand storage and back up from a USB stick. Email alerts are available in case of a hardware problem. Support for AFP and SMB is good for those with a mixed Mac and PC network environment. Many of the 421's features are cleanly

presented and are easy to set up through the browser-based interface. It's worth taking note, however, that it might require delving into your router's documentation in order to enable access to files over the web. The unit has a built-in iTunes server, which detected music even several folders deep, but it did need restarting to make new tracks available. Disappointingly, cover art wasn't visible and playlists can't be created. Our test drives are rated faster than Buffalo's quoted 100MB/s maximum transfer rate for the 421, but even as a striped array they peaked at 59.3MB/s, despite using a Gigabit Ethernet connection.

■ Alan Stonebridge

Verdict

The good presentation is appealing, but some consumer-focused features need fleshing out.



PHOTO PRINTER

\$400 | EPSON.COM.AU

EPSON EXPRESSION PHOTO XP-950

Proof that A3 printers don't have to dominate your desk.

We've often wished that A3 printers weren't invariably double the bulk of their A4 counterparts and Epson's seemingly heard our bleating and produced the new XP-950.

It only occupies around a 25 per cent larger footprint than Epson's A4-only XP-850, giving you A3 printing pros without the space-hogging cons. It's not as if Epson has skimped on features to achieve this, either. Up top is a 4800dpi flatbed scanner, plus you can also enjoy direct printing from memory cards or use the on-board Wi-Fi to connect mobile devices. It has an 8.8cm, touch-sensitive LCD control panel and although its display quality isn't outstanding, the device is clear and responsive. Print quality doesn't disappoint either, with excellent colour accuracy and smooth tonal graduation that's largely free from banding. Greyscale separation is clear too, but despite a respectable

5,760 x 1,440dpi printing resolution, some minor stepping is visible on diagonal and circular test patterns. This rarely affects any real world prints though, which impress with their overall clarity and tonal accuracy. Monochrome output is less impressive though, exhibiting a noticeable cyan colour cast. The XP-950 makes good sense as an occasional A3 printer for the space-conscious, but its relatively low-capacity ink cartridges and premium price do make it vulnerable to Canon's terrific Pro-100. The latter will set you back a couple hundred more, but it's a similar sized A3+ printer and boasts superior print quality.

■ Ben Andrews

Verdict

A very impressive A3 printer that's good for home use, and, happily, not as bulky as some of its rivals.





GAMING HEADSET

\$149 | WWW.PLANTRONICS.COM.AU

PLANTRONICS RIG

Plantronics goes all out in a quest for gaming headset flexibility.

Plantronics hasn't traditionally been the go-to brand for the latest in gaming headset chic. That's not to say it can't produce a decent pair of cans, just that they'd probably look more at home sitting on the noggin of an average call centre operative than in your meticulously styled, feng shui'd gaming sanctuary. However, the new RIG not only breaks this corporate mould, it lobs it through the conference room and into the middle manager's motorised pencil sharpener.

See, the RIG is one sleek-looking headset. It may be primarily plastic, but it's well made and those two-tone black and white lines with red accents exude coolness, as does the ultra-modern headband fabric with its carbon fibre-esque weave.

Expand the headband and subtle head symbols sporting an expanding afro are revealed, helpfully hinting

you may need your mop chopped.

ALL SHOW, NO GO?

The headset itself is only half what the RIG brings to the table. You also get something called the 'mixer'. This sits on your desk like a paperweight, providing intermediary controls between headset and PC. Adjust the volume by way of an outer ring dial and balance the level of your in-game chat with the main audio, courtesy of some backlit sliders. Use it to mute the mic or switch between one of three sound presets: Pure, Intense or Explosive. Who knows which one's which as there's no display on the mixer, but it's nifty nonetheless.

Connectivity is well covered too, with USB and 3.5mm audio outputs linking to your PC, plus the option of an optical digital output to hook up a console. You won't miss any incoming calls either as you can also plug your phone in, where by you'll be able to

switch between game and phone audio using the mixer's large central rocker button.

But the versatility doesn't end there. If you'd like the world to get a load of your new headgear's slickness, then you can detach the boom microphone and in its place insert another (included) cable featuring its own in-line mic and volume control. This will connect straight to your phone or mobile media player of choice, bypassing the mixer to give the RIG genuine on-the-go usability.

Of course, all this tech would be wasted should the sound quality fall short of the same standard – luckily it's up to scratch. Set the mixer's equaliser to the preset that's most to your liking and the RIG offers up crisp, open treble that's well complemented by a tight bass response. This tonal separation translates to an immersive gaming experience, not only for enhancing explosive firepower, but also its ability

to distinguish more discreet noises that could signify the difference between virtual life and death.

If we have one criticism, it's that the overall volume output from the mixer isn't exactly brain shattering, meaning you may need to crank things up to get decent dialogue levels from dynamic audio tracks.

Some may argue the RIGs price tag is steep for a non-surround sound, wired headset. But given this level of style and versatility, it's still great value. **Ben Andrews**

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Plantronics has proven it can produce a gaming headset worthy of a place not just at your PC, but beyond it, too.



The heatpipe has been increased to 10mm to transfer more heat.

ASUS GPU TWEAK

This handy free utility is an intuitive yet powerful way to push the performance of your videocard to the limit. GPU tweak displays the usual figures — clock speeds, voltages, memory voltage and speeds as well as fan speed settings. You can control 2D and 3D clock speeds separately, so you can set up super quiet profiles for non gaming use. You can also control memory timings and set different profiles. GPU Tweak is optimised for DirectCU II cards, but it'll work with cards from other vendors too. It can be downloaded from: tinyurl.com/mbnptk2.

ADVERTISING FEATURE

KEEP COOL UNDER PRESSURE

Push your graphics card to the limit with ASUS DirectCU II technology.

Most manufacturers improve videocard cooling compared to the reference card design, but ASUS has developed new technology to push graphics card performance to a new level. Dubbed DirectCU II, it's actually a collection of upgrades working in harmony rather than a single feature. Not only does DirectCU II improve efficiency and reduce noise, it lets you push your GPU harder while at the same time prolonging its life.

WHAT YOU'LL NEED

DirectCU II can be found on many of ASUS's latest graphics cards (check out our list for exact models) and it's not limited to high-end models either; you'll see it on entry level cards all the way up to top-end flagships. You'll find DirectCU II wherever a graphics card has been (or is

ready to be) tweaked and pushed beyond the reference design to achieve maximum performance. It's also a passive technology, meaning if your card has DirectCU II then you're already reaping the benefits. That said, understanding how the technology works is key in being able to fully utilise its advantages for performance tuning.

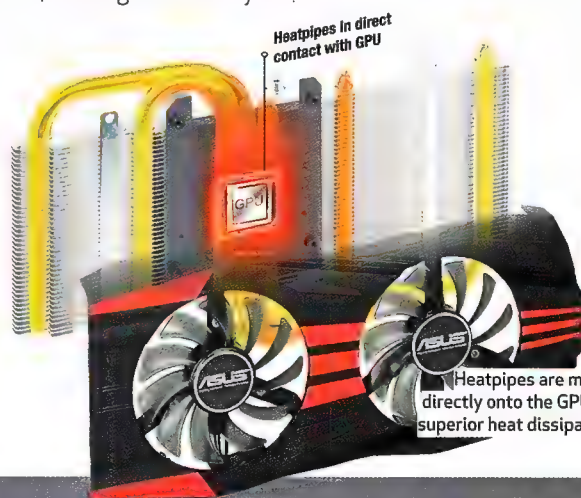
THERMAL ARCHITECTURE

The tricky part of pushing PC hardware to the limit is getting rid of all the heat that's generated. The solution is heat pipes, which use thermal conductivity and the phase transition of a working liquid (often water) to transfer up to 50 times more heat than just a solid piece of metal can. Better yet, they have no moving parts — inside the hot end of the pipe, the liquid is evaporated, absorbing great quantities of heat. It rises up through the pipe, until it condenses on the cooler end (attached to the fins and fan), releasing its heat into the

heatsink, before returning to the hot end via capillary action.

On a graphics card, the biggest issue is actually getting the heat from your GPU's core into the heat pipes, as every join or layer reduces the rate of transfer. To maximise the connection, ASUS uses direct contact heat pipes, where the actual pipe itself is flattened and polished, before being mated onto the GPU. The size of the heat pipes has also been increased, from 8mm up to a 10mm, allowing them to carry

more liquid and transfer more heat. Compared to a reference design cooler which can dissipate 60W, the DirectCU II tech allows the heat pipes to carry 40% more heat, allowing it to dissipate up to 85W. All that extra heat is channelled into a heatsink that has also had an upgrade — featuring 2.2x as much surface area to get the heat into the air faster and more efficiently. The end result is a GPU that can run up to 30% cooler than the reference design.



DirectCU II is available
on many of ASUS's
graphics cards.

CoolTech fans run
quieter than their
regular counterparts.

ASUS DIRECTCU II DELIVERS FASTER GAMING PERFORMANCE WITH REDUCED HEAT AND LESS NOISE.

	AMD REFERENCE DESIGN	ASUS DIRECTCU II	CHANGE
GAMING PERFORMANCE (METRO: LAST LIGHT)	79FPS	84.4FPS	7% FASTER
TEMPERATURE (FURMARK)	85°C	74°C	22% COOLER
ACOUSTICS	45 DB	31 DB	3X QUIETER

ALL TESTS PERFORMED ON ASUS R9280X-DC2T-3GD5.

COOLTECH FAN TECHNOLOGY

Being able to move more heat is one thing, but you still need to be able to get rid of it. The traditional fan designs on reference heatsinks are either axial, which are quiet but do not move air very fast, or blower fans, which move a lot of air but are noisy.

The ASUS CoolTech fans are a custom hybrid design in-between axial and blower fans, giving you the best of both

worlds. This allows the fans to produce wide angle airflow that moves in many directions, maximising how much heat it can move. The blower element of the fan also helps push the hot air out of your PC via the backplate, instead of just circulating it inside the case.

Pushing more air means the fans can spin slower, so the CoolTech fans are up to three times quieter than standard designs, especially when under load. The unique design also

helps reduce accumulation of debris, making them dustproof compared to a normal fan. Running cooler, slower and with less dust can also increase fan lifespan up to 25%.

POWER USE

Keeping the graphics card cooler allows it to operate more efficiently, which also reduces overall power consumption. The ASUS designs feature DIGI+ voltage regulator modules, which pack a 30% higher voltage threshold, alongside Super Alloy Power components that ensure smooth and stable power. DirectCU II combines these power delivery features with an extra power phase (for a total of 10) to lower the voltage noise level, ensuring rock solid stability when experimenting with over-spec voltages and frequencies.

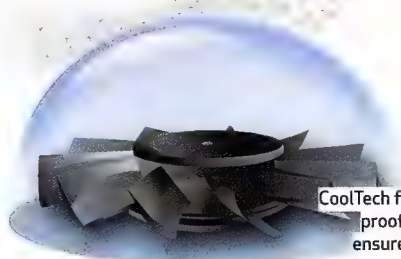
Efficient power use has a secondary advantage too — modern Nvidia GPUs include a power limiter that kicks in to prevent your card from overheating when it's pushed

hard. While it's possible to bypass this to get more performance, doing so could result in a damaged GPU. Because the ASUS cards run cooler and more efficiently, the Nvidia limiter cuts in later, allowing you to push the performance that much further.

THE END RESULT

ASUS's DirectCU II technology enables its graphics cards to run quieter and cooler, which also carries a number of other advantages. For a start, DirectCU II cards are typically factory overclocked, so from the get-go you get higher performance than with a stock graphics card design. For gamers who want to dabble in performance tuning, DirectCU II allows you to wring more megahertz from your hardware.

25% Lifespan



CoolTech fans include dust
proofing, which helps
ensure a long lifespan.

ASUS®



GAMING LAPTOP

\$1,999 | WWW.GIGABYTE.COM.AU

GIGABYTE P35K

A subtle, slim and affordable gaming laptop. Surely you jest!

'Subtle' and 'gaming' are two words that rarely go together, but a new trend in slim gaming laptops could potentially change all that. The P35K is a good example: it's a mid-sized 15.6-inch gaming laptop that tries to strike a balance between practicality, portability and performance — and it does a reasonable job too.

Physically, it uses a mix of plastic and aluminium in the chassis; the top of the lid and the keyboard deck are aluminium, while the base and bezel are plastic. That's a fair trade off given the sub-£2,000 price and results in a laptop that still feels quite sturdy while helping to reduce weight. (That's 2.16kg sans power adapter.)

From a user interface front, there's little to complain about, with a big trackpad, comfy chiclet keyboard and a warm IPS screen. If we did have one gripe, it's that the latter is a little too red-hued for our tastes. While a red cast makes skin tones look very organic, it has a

tendency to dull green hues so they look more brown than they should. It's not the worst thing, but we would have preferred a more neutral cast.

Inside, there's a Core i7-4700HQ CPU and GeForce GTX 765M GPU combined with 16GB of memory powering Windows 8 as the OS, plus a 256GB mSATA SSD and 1TB 5,400rpm hard drive for storage duties. The P35K's input ports are a bit mixed however, putting old and new side by side. There's two USB 2.0 and two USB 3.0 ports, VGA and HDMI video outputs, SD card reader and 3.5mm audio I/O alongside a tray-loading DVD-RW. That's an adequate line up for this price, but MSI's GS70 (see page 36) shows that you can do it better.

Gigabyte's included 'Smart Manager', a control panel program that gives you a central place from which to switch hardware components on and off and adjust their associated settings. You can turn the trackpad on and off and disable the Windows key

for when you're gaming, for example, or control how fast the fans are allowed to spin, as well as adjust keyboard backlighting brightness, switch to different power saving modes and adjust whether the GPU is allowed to boost up to higher speeds.

Some of those are more useful than others. Selecting 'Power Saver' from the different modes added only 3 minutes battery life, and while switching the fans to silent mode does quieten it down a little (under normal operation, it blasts its fans at a rather in-your-face noise level), it won't completely silence the beast.

In terms of overall gaming speed, there's a hair's width between this and the MSI GS70 — which isn't a huge surprise given that their core components are basically identical. While they won't get you as much performance as an equivalently-priced desktop, they can both manage current games at their native 1080p screen resolutions with

medium-level details.

However, one area where the P35K did perform significantly better than the GS70 was in battery life. That smaller screen size does bring benefits, with the Gigabyte managing another hour on top of the MSI in both our battery-life tests.

All in all, it's pretty well-rounded. It's lightweight with enough battery life to be taken on the road, but can still play new games. Combine this laptop with a decent 1080p screen at home, plus a mouse and keyboard, and you have a very attractive do-all gaming PC at a keen price. ■ Dan Gardiner

Verdict

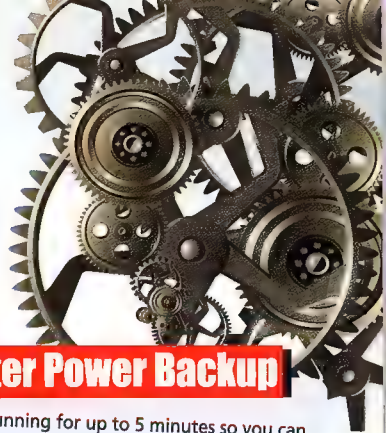
Features
Performance
Value



This compact gaming laptop does an impressive job of combining portability with performance — and doesn't cost the Earth either.



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Laptop Power Supplies

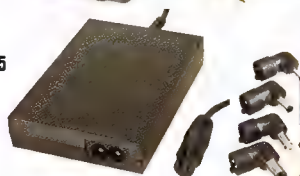
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MP-3321 \$49.95



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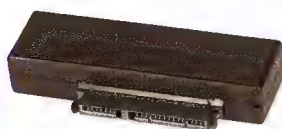
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SATA to USB 3.0 Adaptor

A simple way to access files on a SATA hard drive.

- Includes USB 3.0 cable and mains adaptor

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USB to IDE and SATA Hard Drive Adaptor

Allows you to use an ordinary IDE or SATA disk drive on a USB 2.0 interface. Ideal for repairs or data transfer.

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Hydrodynamic Bearing Case Fans

Designed to provide additional airflow without increasing noise levels.

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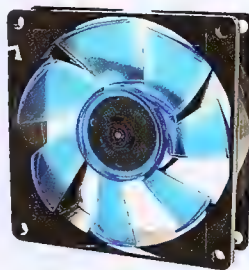
FROM \$19.95

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- Dust & waterproof to IP54

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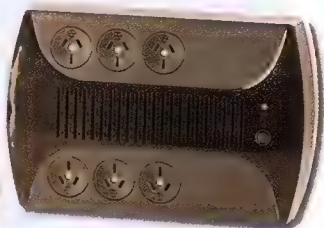
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Keep devices running for up to 5 minutes so you can shutdown safely without damaging equipment or losing data.

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- 3 UPS & 3 surge protected outlets

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- 300Mbps wireless connectivity
- Plug and play
- Complies with wireless 802.11b/g/n standards

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Allows you to store and access files on your network or across the Internet using a web browser or Smartphone. See website for full list of features and setup options.

- Supports 3.5/2.5 inch SATA hard drives

XC-4691

Note: HDD not included, and requires freely available third-party app for Smartphone support.



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GAMING LAPTOP

\$2,299 | AU.MSI.COM

MSI GS70 STEALTH

A great big slab of laptop gaming prowess.

If Gigabyte's P35K is the gaming laptop equivalent of a fighter jet, then MSI's GS70 can probably be thought of as a stealth bomber, if not when it comes to firepower, then certainly in its footprint. While it's true that the GS70's slim form factor does a good job of disguising the gaming prowess inside, the 17.3-inch 1080p screen means it's still a very big unit.

And despite MSI's 'Stealth' name, it's not as discrete as the Gigabyte – at least not when you first open it and see that keyboard. The GS70 is decked out with a SteelSeries-branded keyboard with rainbow-coloured backlighting and stylised, angular letters on the keys. That backlighting can thankfully be switched off, or changed to a more discrete colour thanks to colour-adjustable LEDs. The board's split into three separate zones (left, middle and right) which can each have their own colour.

We're not quite sold on the keyboard as a whole however.

While there is a full numpad, the keys are a little narrower than usual and, on our test unit at least, we had problems with the Esc key and its direct neighbours sticking a little. The keyboard does feel quite stable though – keys wiggle less when you strike them and are raised marginally higher than on the Gigabyte P35K.

There is a nice big trackpad – one that makes use of the space available – and around the chassis' sides there's four USB 3.0 ports, two DisplayPort and one HDMI output, an SD card reader and Gigabit Ethernet. Both the Ethernet and 802.11n Wi-Fi are 'Killer DoubleShot' branded parts – which includes a manager app for setting up Quality of Service, letting you prioritise gaming network traffic above downloads.

In terms of core hardware, the GS70 takes a middle-of-the-road approach, with an Intel Core i7-4700HQ processor, GeForce GTX 765M graphics chip, 16GB of RAM and storage provided by a 128GB SSD for OS

and games and 1TB 5,400rpm hard drive for storage. Nothing too surprising there – but we do wish the SSD was a bit bigger.

That big matte screen produces slightly cool but fairly neutral and balanced colours. Contrast could perhaps be a tad better; you lose some details in very dark games, so you'll need to bump up in-game settings to compensate.

Like Gigabyte, MSI's also included a System Control Manager program that allows you to turn features on and off (webcam, Wi-Fi, Bluetooth) or switch power modes. It's not quite as full-featured as Gigabyte's – there's no fan speed controls, for example. And on that front, one thing the Stealth isn't is particularly quiet. To be fair, it is quieter than most gaming notebooks; the fan noise that the GS70 produces is subtle, a low hum that while audible, isn't as overbearing as you'll get from bigger laptops.

So is the GS70 good value overall? That really depends

what you're after. If you want a relatively low-key (but huge-screened) laptop for gaming, this one's not too shabby. On the other hand, Gigabyte's P27K has similar specs, but a 256GB SSD vs this one's 128GB and sells for around \$400 less. It's not nearly as sleek and thin and it lacks the Steelseries keyboard and Killer networking, but with significantly better battery life (4 hours vs 2 here) it's perhaps a bit more practical. For us, which one works better for you will depend on if you want to take your laptop on the road with you. ■ Dan Gardiner

Verdict

Features
Performance
Value



Packs some unique gaming oriented features and despite the slim chassis this one's still a solid gaming performer.





ANDROID TABLET

\$320 | WWW.SAMSUNG.COM/AU

SAMSUNG GALAXY TAB 3 8.0

Samsung builds a Nexus 7 beater, but is it too late to the party?

Samsung's 8-inch Galaxy Tab 3 feels like a device designed to fight some very specific enemies in the form of the original Nexus 7 and iPad minis. Unfortunately for Samsung, those are competitors that have since retired from the field and been replaced by younger and more lively successors... which essentially leaves this Tab 3 outclassed in a new age of tablet warfare.

As a point in case, it packs a dual-core processor in an age where everyone else has quad core ones, has 1.5GB of RAM when everyone else has 2GB and packs a 1,280 x 800-pixel screen when everyone else is rocking better-than-1080p (ie. 1,920 x 1,080-pixel) models.

If the Tab 3 8.0 had launched in late 2012 it might have had a better chance. It's easy to see the overall goal Samsung had in mind and the Tab 3 certainly does have some attraction when compared to last year's

Nexus 7. It's lighter (314g vs 340g) and slimmer (7.4mm vs 10.5mm) and has a more appealing screen – one that really fills up the Tab 3's front face, thanks to narrow bezels on its left and right sides.

The 8-inch, 1,280 x 800-pixel panel driving it is bright and clean, with much better colours and contrast than those of the Nexus, which looks washed out and flat by comparison. Samsung's use of hardware-based buttons also means that apps actually get to use much more of that screen too; on the Nexus, a slice of the display is often consumed by the Back, Home and multitasking buttons. There's a microSD card slot in the side for expanding the Tab 3's 16GB or 32GB of onboard storage – something that's conspicuously absent from all Nexus devices.

Throw in dual-band Wi-Fi (the Nexus 7 only has single-band 2.4GHz) and you've got another feature to laud over Google's option.

And despite only having a dual core processor, to be fair, the Tab 3 8.0 generally doesn't feel sluggish. Interface elements are reasonably responsive, though there's the occasional stuttery transition effect (or completely missing one) where the processor isn't quite up to the smooth animations that newer, faster models are. And we did find you did need to be a bit patient when pulling open Android's notifications area, pausing for half a second to ensure that the touchscreen had caught our intent. Likewise, in side-by-side comparisons web pages often took longer to load using Chrome here than on the Nexus 7 – sometimes by a factor of two.

What the Tab 3 8.0 does have going for it is that it's comparatively cheap – we've seen it regularly on special for below \$300 from big chain stores – but a lot has changed in the year since the original Nexus 7 arrived. The 8.0 inch Galaxy Tab 3

has essentially shown up to what is now a sword fight with a sharp stick. It's a carefully sharpened one, to be sure, but we can't help but feel prospective owners are, without much delay, going to feel like they've ended up on the raw end of it.

If you're patient and not too demanding this is a mini tablet that can still get the job done, but if you're spending \$300, we'd be inclined to stretch up to the newer Nexus 7 – which you won't want to replace 6 months down the track. ■ Dan Gardiner

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Gets the job done, but it's behind the times when it comes to specs and value.





SMARTPHONE

\$899 | WWW.SAMSUNG.COM/AU

SAMSUNG GALAXY NOTE 3 4G

How big is too big?

Released in 2011, the original Galaxy Note was the monster-sized smartphone that birthed the 'phablet' category, packing a 5.3-inch screen in an age where the market-leading iPhone was still a comparatively tiny 3.5-inches. The Note seemingly proved that size does matter and it became something of an unexpected hit for Samsung. The company's strategy with successors has been to see just how far it can push that screen size before a device becomes ridiculous and unwieldy, with this third-gen offering squeezing a 5.7-inch, 1080p display into a chassis that's actually a bit slimmer (both width and depth wise) than its forebear. It's also easier to hold thanks to a rubber back (designed to imitate leather) which makes it less slippery than

its predecessors.

The included stylus also operates a little differently. Rather than flinging you to a stylus-optimised home page when you pull it out, you're now presented with a little overlay that includes access to pen-driven note-taking, search and the ability to run selected apps in a window or launch overlay utilities like the calculator, phone or contacts list.

And it's hard to fault on performance; with similar but slightly upgraded hardware to the Galaxy S4 (a quad-core Snapdragon 800 SoC at 2.3GHz and Adreno 330 graphics chip) the Note 3 is exceptionally fast and fluid in use and in benchmarks, too. (That's the case regardless of having to shave off 10% of the scores, because Samsung cranks up the device's CPU and GPU when it detects known Android benchmark

apps.) This is an Android 4.3 phone that's smooth in operation, with Samsung seemingly having ironed out those slight stutter issues we saw in the Galaxy S4.

So is 5.7-inches too big? We'd say no... just. If you've used the Note II, you probably won't have any trouble adjusting. The thinner edge bezels actually mean your thumb is operating in about the same area when it comes to keyboarding. Stretching vertically is a little tougher, however; unless you've got particularly large hands, reaching the very top of the screen is going to require a two-handed approach. At times, we also found the short bezel above the Home button a little clunky — our thumb often encroached onto the bottom of the screen and that can mean you're tapping onscreen elements at the same time as you're pressing

the home button. Depending on the app, that can have unwanted consequences — we deleted more than a few emails in the default Samsung email app before we learned to be more careful, for example.

If you've already got a Note II, there's perhaps not quite enough here to justify an upgrade. For anyone else just looking for a big phone that's still (just) comfortable, this is one worth taking note of.

■ Dan Gardiner

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Samsung's latest Note doesn't mess with the winning formula, but it's close to pushing the boundaries of one-handed usability.



PORTRAIT TV BRACKET MOUNT

- Universal mounting pattern
- Large TV size: 32"-65"
- Load Capacity: 75 kg
- Maximum VESA: 200x600mm

\$37⁹⁸

ANBTPWB01

ELECTRIC PROJECTOR SCREEN

- Electric 16:9 Aspect Projector Screen
- Infra-Red remote control operation
- Large 3M x 1.68M

\$276⁰⁰

ANBTPJAA13

Brateck

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Brateck's range of screen mounting solutions are ideal to accommodate the many screens in your life, for a whole range of applications!

ULTRA-SLIM TILTING WALL BRACKET

- Wall bracket for large 37"-63" TV's
- Supports flat panel TV's up to 75kgs
- Low profile of only 46mm

\$38⁰⁰

ANBTPLB43



SECURE ENCLOSURE FLOOR STAND

Secure iPad display with lock
Bolts to floor for added security
Padded internally to protect iPad

\$79⁹⁵

AWPAD1202A

FREE STANDING DUAL MONITOR STAND

DUAL Horizontal Monitor Stand 13 - 27"
Adjustable height, tilt / pan and rotation
10 Year Warranty

\$98⁰⁰

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- Shop Displays
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software

» APPS FOR ALL THE PLATFORMS BY PETER DOCKRILL & CRAIG GRANNELL



Windows SOFTWARE

Windows 8.1 update

Service Pack 1, by any other name...

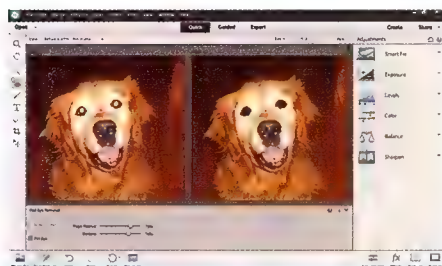
FREE | MICROSOFT | WINDOWS.COM

Just in case you somehow managed to miss our massive 12-page cover story last month, Windows 8.1 is kind of a big deal. Why? Because it's Microsoft's first substantial opportunity to address and enhance many of the UI bugbears users have complained about with Win 8's controversial Modern/Traditional desktop dichotomy, including making it easier than ever to completely bypass the live tiles environment at boot if you're of such a mind. Plus there's new apps, new Bing search options, deeper SkyDrive



integration and much more.

The 8.1 update is now available for download — and even if you did miss our November cover story, you won't be able to miss Microsoft's plug for 8.1 within Windows 8's Store app (a large promo tile is the first thing you'll see on launching if you haven't already updated).



Photoshop Elements 12

\$129.99 | ADOBE | WWW.ADOBE.COM/AU

If you want something with considerably more functionality than Adobe's deliberately constrained Photoshop Express freebie — but a subscription to the professional-grade Photoshop via Creative Cloud would be going overboard (for your wallet, not to mention skill set), Photoshop Elements has the middle ground covered. The latest release includes new mobile editing and sharing options (via Adobe Revel), content-aware features like object moving and straightening, auto smart-toning, plus eye correction for pets to ensure your beloved furry friends are always looking their best — not like the Terminator. In this era of underpriced apps, \$130 might seem like a king's ransom, but if Adobe quality is what you're after, this isn't expensive (plus it's comparatively cheaper if you bundle it with Premiere Elements).



500px

FREE | 500PX | TINYURL.COM/MRLBC7X

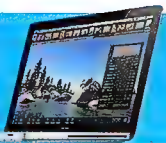
If you're looking for a little visual inspiration to help you make the most of splashing down on your Photoshop Elements investment, look no further than 500px. The official Windows 8 app for this absolutely delectable photo-sharing (and selling) community lets you feast your eyes on the work of over 1.5 million creative and/or professional photographers. 500px isn't so much a place to bulk-stash uploads like Facebook, Instagram or Flickr, but rather a crowd-sourced gallery where users draw attention to each other's best snaps. While there's not an awful lot of functionality in the app, photos display in gorgeous full screen, making it easy to get lost in the visual parade. So what are you waiting for? Sumptuous images await. (Windows 8 only.)



GREAT BIG WAR GAME

\$2.99 | RUBICON MOBILE | TINYURL.COM/KEURL7D

Paul Johnson, the head of strategy game makers Rubicon, made quite the fuss a little while back when *Great Big War Game* was first brought to the Windows Store, after his studio invested considerable cost in porting the title to the platform (\$16,000) and yet only netted less than \$100 in their first week on sale — which shows just how tough it is for developers to stand out in app stores. Which is a shame, especially since GBWG is an absolute cracker of a game. Taking its cues from Nintendo's legendary *Advance Wars*, GBWG is a turn-by-turn strategy title with its tongue firmly planted in its cheek. Excessive micromanagement means later levels can be a bit tiring, but for \$2.99 you simply won't find better gaming value. (Windows 8 only.)



Mac » APPS

Interacto Labs Flavours 1

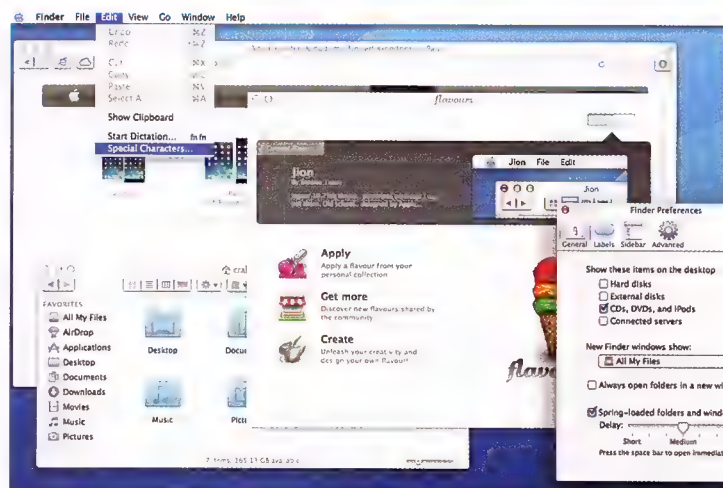
Obtain the power to create your own personalised OS X interface design.

US\$20 | INTERACTO LABS | FLAVOURS.INTERACTO.NET

If you're of a certain vintage, you might still remember Kaleidoscope, a classic add-on for radically altering a Mac's appearance with a couple of clicks. Flavours is a broadly similar modern effort for OS X, but in addition to working with ready-made themes, it lets you create your own.

Adding a theme is simple: browse examples, select one, log out and log back in. Any app using the standard OS X Aqua theme will be transformed, and any using a custom theme — such as Apple's Reminders — will simply ignore Flavours. You can also define specific overrides, such as for if you'd prefer your desktop or menu bar to be untouched. Straightforward reversion is available through a prominent switch.

During testing, many dozens of user-submitted themes were available, ranging from the astonishingly ugly to some rather pleasing, appealing, minimal efforts, and some amusing



tributes to old versions of OS X. Flavours caused no stability issues, although some themes made OS X hard to navigate, and darker ones were often stymied by Flavours' inability to change system font colours.

Fortunately, if you can't find an off-the-peg theme you like, the editor makes it simple to craft your own. However, as much as we were impressed with the live preview and well-designed inspector, it rapidly became apparent that making major changes to OS X's appearance isn't a five-minute job. You should expect to spend at least an hour or two creating your own themes — although we imagine you'll enjoy doing so.

Quick Print 1

\$11.02 | HYPERBOLIC SOFTWARE | HYPERBOLICSOFTWARE.COM

Mac printing can be sped up by selecting a file in Finder and pressing Command-P — the parent app launches and skips you right past the print dialog. Quick Print almost provides the opposite — it doesn't launch any apps, but it lets you amend print settings before confirming a print job. Initially, we struggled to see the utility in this workflow, but Quick Print's usefulness became apparent. We could print Word documents without opening Word, or make PDFs of text

files without launching the app they were created in. The speed bumps over standard workflow were slight but noticeable. Quick Print is also pleasant to use, providing basic in-context controls, such as image rotation and the ability to explore a PDF's pages. If you select a folder, you can print its listing — handy for back-up discs. While this app isn't essential, it's certainly good enough to warrant a recommendation.



Coppertino VOX 1.1

FREE | COPPERTINO | COPPERTINO.COM/VOX

VOX is an audio player with a dinky playback window, but it still has plenty of power. The app can use your iTunes library as a source, but there's also a separate VOX playlist. You can populate this with MP3 and AAC files, but also music in formats iTunes won't play, such as FLAC and CUE. VOX can be set as the default for all audio. However, we had some niggles. With large collections, the

interface is a bit awkward; you must install a System Preferences pane to control VOX using media keys or an Apple remote. There's no gapless playback for classical and mix albums, and the graphic equaliser is poor. Otherwise, we found VOX to be a usable, stable, well-considered audio player. It's more lightweight than iTunes and is at least Ecoute's equal; wide format support will propel it to top spot for some.





App Store » iOS APPS

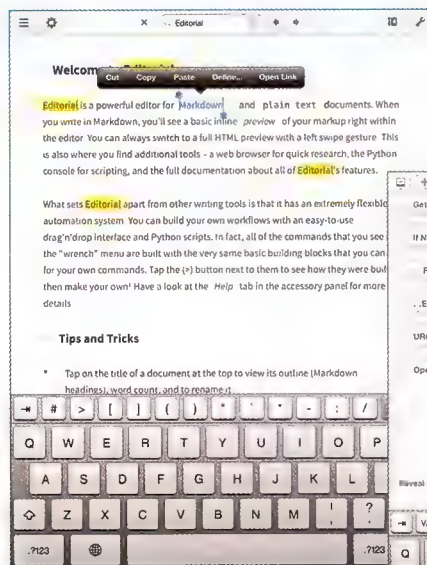
Editorial

This writing app is like a cross between TextEdit and Automator.

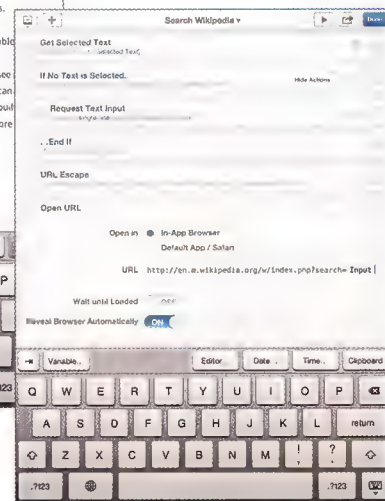
\$5.49 | OMZ SOFTWARE | [TINYURL.COM/MMXTWUT](http://tinyurl.com/mmxtwut)

Editorial is a serious writing app. Well, it's a serious app for writers, anyhow, but its best stuff isn't really about putting the words on the page — it's about what you need to do with those words. Editorial lets you create 'Workflows' that you can use on your text and Markdown documents, which are just like Automator workflows on your Mac, really. You build up what you want the app to do from Action blocks, such as 'Get document text', 'Find/replace', 'Create Tweet', 'Show an Alert' and loads more, including writing custom commands in the Python coding language.

It's a really powerful system that is capable of doing everything you need it to for your writing projects, be that counting how many words you've written to reformatting HTML for you. That said, the blocks can be much more confusing and limiting than they first seem unless you can write some code for yourself.



However, it's easy to download Workflows others have made, making it massively expandable. But, alas, it's not the best pure writing app in the world — annoyingly there's no live



word count or typewriter mode, for example — but it's still an extremely usable app.

The Human Body

\$2.99 | TINYBOP | [TINYURL.COM/K2ADXOV](http://tinyurl.com/k2adxov)

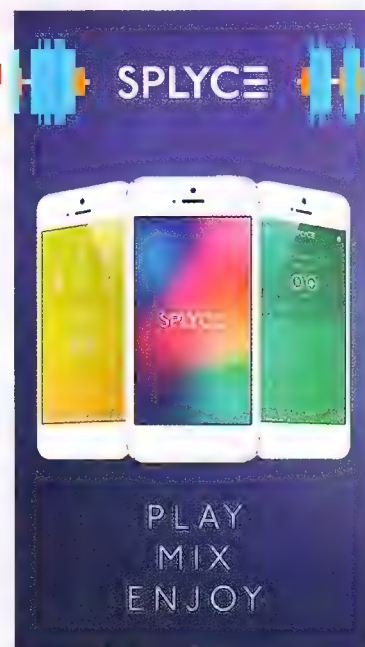
This anatomy app aims to let kids explore how the human body works without getting into photorealistic innards or awkward areas. Different systems in the body are presented in cutesy cutaway graphics. Seeing over-sized blood cells pumped into a cartoony-but-accurate heart, through the valves and out of an artery, gives a clear sense of how the organ works. Sadly, not every part of the app makes as much sense. Tap on areas of the brain to be shown images corresponding to what that portion of the brain does, but it's unclear how many sections of the brain you can tap, or exactly what the different areas are supposed to be showing. Similarly, some elements, such as the skeleton and muscle close-ups, are just bare bones (ahem), with little revealed by the basic interaction. Though you can turn on labels to show the names of different parts of the body, there's no further explanation.



Splyce

99 CENTS | INQBARN | [TINYURL.COM/KF7V9QO](http://tinyurl.com/kf7v9qo)

Splyce is a music app with the ability to analyse the beats per minute of your songs, order them based on that, and mix between them — all automatically. You can make it so every song has a faster BPM than the last (good for running), with Mix modes determining how one song flows into the next. It can also control Philips Hue lights for a party mood, but the mixing is where this app's strength lies. It's not that great a strength, though. It has no way of knowing if songs will flow together when it sets the order itself, and they usually don't. It can produce odd results when changing songs' speeds to beat match. It's best if you come up with a playlist order yourself that you know will mix well, but that makes some of the options seem redundant. It's not a convenient music app, either. Sometimes, Splyce produces fun results, but we're not sure we'd let it loose on a party.





Google Play » ANDROID



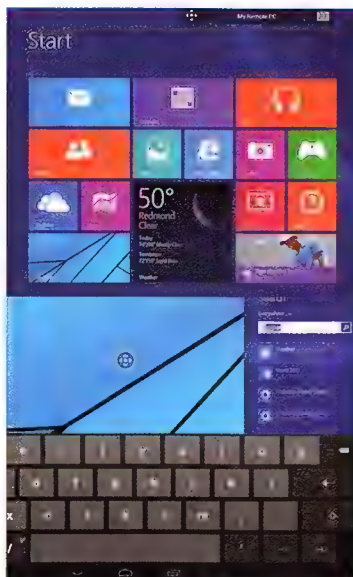
Humble Bundle

Name your price, and it's all in a good cause.

NAME YOUR PRICE | VARIOUS | WWW.HUMBLEBUNDLE.COM

OK, so we're cheating a little this month with Humble Bundle for Android, because it's more of an app resource than an app, but we're comfortable with stretching the rules a little this one time, because Humble Bundle is definitely something you should know about.

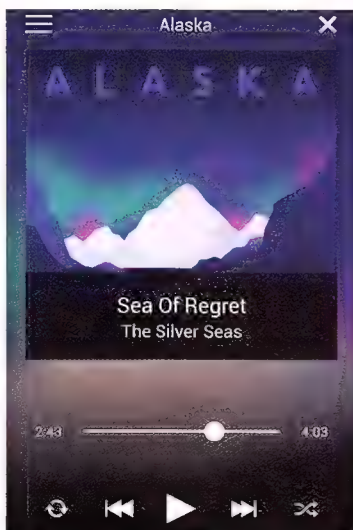
Every few months or so, the HB team curates a selection of some of the best Android games available and sells them in a special collection for which you can pay whatever you want (and decide where the money goes). Humble Bundle is also available on desktop, but on mobile it's an Android exclusive (as other OSs restrict side-loading apps). Sign up to keep in the loop when the next HB hits, and check out the HB Beta app too, which lets you manage your purchases.



Microsoft Remote Desktop

FREE | MICROSOFT | TINYURL.COM/MVQFNTZ

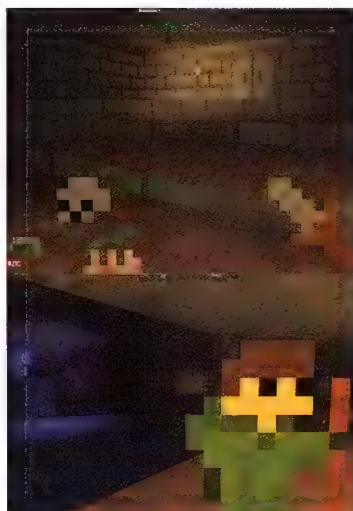
There's already a number of remote control and remote desktop style apps out there in the mobile marketplace (with Splashtop being one of the most prominent apps), and once you're invested in one that works well for you most users are probably happy to stay put. But Remote Desktop, a new release from Microsoft, is worth a look. For starters it's free (on both Android and iOS), and doesn't require you to install any client software on the host PC like most other solutions. However, this comes with a significant caveat: to support Remote Desktop your Windows PC of choice will need to be a Pro/Enterprise/Ultimate variant of the OS. Entry-level Home editions (including Windows 8) aren't supported out of the box.



Rdio

FREE | RDIO | TINYURL.COM/LNDBYYU

There's an awful lot of competition in the streaming music space, and it's only getting tighter with tech giants like Google and Apple muscling in on the territory staked out by Spotify and Co. While some of the services on the market offer free streaming options (in addition to commercial subscriptions), it seems none have been willing to let their mobile apps provide this functionality — with the exception of Guvera, which offers free ad-supported listening on mobile. Rdio is the first of the big-name players to go free on mobile, offering its radio-esque Stations feature for free on Rdio mobile apps on Android and iOS (and with no ads to boot). There's about a zillion stations on offer, including genres and artist-specific playback. Free and no ads: simply awesome.



Delver

\$1.96 | PRIORITY INTERRUPT | TINYURL.COM/7H3NL4R

Looking more than a tad like a *Minecraft*-inspired effort (or perhaps even *Ultima Underworld*, when the appearance of pixels wasn't an ironic stylisation, if your memory stretches back that far), Delver is a nostalgia-flavoured first-person dungeon crawler that charges you with recovering the 'Yithidian orb'. (That's actually about as far as the plot goes.) And the simplistic setup isn't Delver's only oddity. Each level is randomly generated, ensuring no two quests are ever the same, and the game also features a rather punishing 'perma-death' system: get slashed by too many swords or struck by too many mystic fireballs and your adventuring is over for good. A fun game, if a little difficult to get to grips with. Also available on Win/Mac/Linux.



Windows store » WIN PHONE 8

Fitbit Tracker

Get off the couch and move!

FREE | SHANE CHISM | TINYURL.COM/M4EJZCB

Apple, Samsung and other tech manufacturers are all starting to jump onto the 'quantified self' tech fitness bandwagon, incorporating built-in motion trackers into their devices, but Fitbit nonetheless remains in a strong position.

While adopting Fitbit's ecosystem does mean you need to purchase a standalone accessory to track your activity, the company's wearable doodads are eminently more practical and comfortable (and probably healthy) than constantly ensuring your smartphone is lodged in your pocket. Plus from under \$70, Fitbit remains one of the most affordable ways to enter the digital fitness market. This nifty free third-party companion app for Windows Phone uses Fitbit's official API to help you keep tabs on your progress and supports pinning to your home screen (which could be a great motivational tool).

fitbit tracker

ACTIVITY

🕒 TODAY

👣 2,268 STEPS 45% of 5,000

🏠 3 FLOORS 30% of 10

🔥 1,188 CALORIES 48% of 3,296

📍 1.1 MILES 22% of 5

🌸 229 ACTIVITY 23% of 1,000

fitbit tracker

WEIGHT

🕒 TODAY

🏠 199.3 BMI 26.3

May 14 🏠 199.3 lbs

May 13 🏠 199.3 lbs

May 12 🏠 200.6 lbs

May 11 🏠 200.6 lbs

May 10 🏠 200.6 lbs

May 09 🏠 200.4 lbs

May 08 🏠 200.8 lbs

May 07 🏠 202.2 lbs

CarStand

FREE | VITOSHA CODERS | TINYURL.COM/O34BK24



About a year ago the laws in New South Wales regarding the use of mobile phones by drivers in cars

changed, meaning you can only use a mobile to make or receive a call if the phone is secured in a fixed cradle (or operated hands-free by technologies like Bluetooth) and limiting other use to navigation and audio control. While every state and territory's particular laws will differ, the principle is the same: it's unsafe for drivers operating vehicles to look away from the road. Which is where CarStand for Windows Phone comes in handy. At a glance the oversize dashboard app — once properly mounted, of course — provides an easy way of checking time, location, battery strength, forecast, plus there's music playback controls and more. Drive safely folks!

Six-Guns

FREE WITH IAP | GAMELOFT | TINYURL.COM/MTD7XR2



What is it about Gameloft games that so often leaves us wanting more? Not in that they're actually moreish —

which, to be fair, they sometimes are — but rather the nagging sensation that they're missing some vital soul or spark? Perhaps it's the fact that no matter how much attention they lavish on rich, well-presented 3D gaming environments, even the best and most-polished Gameloft titles are still relatively uninspired clones of other 'original' games — and in almost every case, the predecessor remains the better playing experience. Take *Six-Guns* for example. It's a spot-on mobile clone of Rockstar's *Red Dead* series. There's lots to see and do (and shoot), although the sense of immersion isn't the deepest. At least it's free — but you'll have to stomach IAPs.

Compass Deluxe

FREE | XCELLARSOFT LIMITED | TINYURL.COM/M54XVEO



Windows Phones already come equipped with full mapping capabilities (like Nokia's Here Maps on Lumia

devices, for example), but if you want a simplified solution which is perhaps a little more configured to on-the-go navigation, you could do worse than Compass Deluxe. This easy-to-use app makes it a cinch to find your way around your current, zoomed-in location, with a choice of different cartographic modes (road, terrain, aerial, hybrid) and the ability to highlight or hide landmarks and pedestrian features. Navigating a course somewhere on the display is as simple as depressing your finger where you want to go, or you can search by address (or geo coordinates). Not a bad little helper to keep on your home screen for when you're out and about. ■

superguide » pint-sized powerhouse

BUILD YOURSELF A

PINT-SIZED POWERHOUSE

While big is undoubtedly beautiful, we reckon petite has its place too. This month, **APC** shows you how to shrink down your PC to create a killer mini system without any sacrifices.

Minimisation. It's a central element to the entire PC industry. So why the heck has it taken so long for our desktop PCs to get smaller? There are doubtless hundreds of reasons for that, so we won't dwell; after all the important thing is that we're finally at a point where you can create an awesome mini PC all on your own.

While it's been possible to buy truly compact PCs for more than a few years now, these machines have by and large been pitched at corporate use, with limited configuration options and/or not much appeal to enthusiasts and those of us who like to build our PCs from scratch.

All that's changing, largely thanks to the mini-ITX standard finally gaining some traction. Mini-ITX has been in the market for more than a decade, it's taken until now for it to really take off. Perhaps it's the fact that our lives are often dominated by smaller computing devices like smartphones and tablets that's seen them suddenly rise in popularity, but whatever the case, there's now a huge range of options available for the mini PC builder.

That largely means small motherboards (which can still pack in a surprising amount of features) and petite cases – and makers of the latter seem happy to experiment with all sorts of shapes, orientations and whacky designs. (Taiwanese vendor Lian Li even

has one mini-ITX case designed to look like a shrunk steam train – and it's alarmingly well built.)

While many parts of this superguide are broad and can be used as a guide to building an all-purpose desktop PC, we've also included some focus on creating a lounge-room PC, which in many ways is the new frontier that the PC has long eyed off but never quite cracked.

Games company Valve's new Steam OS (due for release in early 2014) could help carve out a path for others to follow, but there are already some great options in place – and one of the joys of this sort of thing is to do some trailblazing for yourself.

So grab your tools, head to the page and get on building!



REALLY MINI MOTHERBOARDS

The latest mini-ITX motherboards prove that you can create a pint-sized PC that packs a punch. Bennett Ring tests eight options from Intel and AMD.

Technology has an obsession with size but, unlike most male-centred industries, bigger isn't always better. Engineers are fixated with shrinking our gadgets, making desk-bound devices small enough to fit inside the pockets of even the tightest jeans. The latest computer component exposed to the magical shrink ray is the backbone of the modern PC, the motherboard. At this year's Computex expo a dominant theme was Mini-ITX motherboards. Measuring just 17 x 17cm, these postage stamps of printed circuit boards have actually been around for more than a decade, introduced back in 2001 by VIA Technologies.

Unfortunately the price of these boards remained prohibitively expensive until recently, with the specialised components required by such small PCBs out of the price range of the average PC punter. However, over the last decade the

prices continued to plummet, until they reached the wallet-friendly levels of 2013, making them finally ready for the mainstream market.

The small size makes these motherboards the perfect fit for several PC niches. Tiny gaming computers that can easily fit under the TV or into a backpack are one such option, yet they can still pack enough punch to run even the most demanding games. Home Theatre PCs that can squeeze into the same space as a DVD player on your AV rack is another obvious use. However, the most interesting placement of a Mini-ITX board that we've seen is in the rear of an all-in-one computer, but we've only seen a single prototype on the market to feature a removable Mini-ITX board.

Obviously compromises have to be made when building such a small board, especially when it comes to expansion ports. Every Mini-ITX board we've seen has just a single PCI Express slot, severely limiting build options, although several include an extra mini-PCIe slot. As a result,

if you're planning on using one of these boards for an entertainment device, it's wise to check which onboard audio solution it's packing, as you won't be able to add a quality soundcard in later.

These motherboards are also stuck with just two memory slots, but at least the memory used is regular DDR3, and not the SO-DIMM sticks required by Intel's NUC form factor. Unlike earlier Mini-ITX boards, most of the newer boards now include the overclocking features commonly featured on full-sized ATX boards, including high-end power circuitry. The Socket 1150 used on the latest generation of Haswell powered Mini-ITX boards also has enough room for most enthusiast coolers; we used the Corsair H80i water cooler for our tests, attached to an Intel Core i7-4770K CPU.

As you'll see from the following reviews, there's fierce competition in the Mini-ITX market. Join us to find out which is the perfect companion for your new miniature PC build.



\$120 | WWW.ASROCK.COM

ASROCK H87M-ITX

A tiny board with a tiny price.

If money is an obstacle, this mini-motherboard from ASRock could be just what your financial adviser ordered. As the second cheapest product in the roundup, it's no-frills approach to Mini-ITX motherboard design covers all the basics.

As you can see from the photo, this board lacks the extras of more expensive offerings. For starters, it's built around the more affordable H87 chipset from Intel, limiting memory support to just twin sticks of DDR3-1600MHz. This chipset also removes official support for multiplier-based overclocking, but ASRock has hacked the BIOS to re-enable this feature, provided you're running a K-series CPU.

Note that the power regulation on this board is very average though, so don't expect record-breaking overclocks.

Four SATA 6Gbps ports sit alongside another six USB 3.0 ports (two of which are delivered by a front panel header), as well as four legacy USB 2.0 connections and a single e-SATA. Video out is provided by DVI-D, D-Sub

and HDMI 1.4, allowing the connection of up to three displays.

Intel's Gigabit Ethernet is replaced by a more affordable Qualcomm Atheros Gigabit solution, while the base-level Realtek ALC892 powers an S/PDIF output and four analogue outputs for surround systems. As expected, audio quality was simply average.

It might be extremely cheap, but it's possible to pick up far more feature-rich boards for just \$20 more, such as Gigabyte's H87N-WIFI product. As a result we can only recommend the ASRock H87M-ITX for those with the tightest of budgets.

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

It doesn't get much cheaper, but if you can stretch your budget just a little, there are better options for your miniature PC.



\$169 | WWW.ASROCK.COM

apc
RECOMMENDS

ASROCK Z87E-ITX

What a difference \$50 makes.

Welcome to the ASRock H87M-ITX's big brother. Costing just fifty bucks more, the Z87E-ITX is a superior product in every regard. Let's see what that extra fifty dollars delivers.

Most obvious is the use of Intel's higher-end Z87 chipset, which brings much better performance to the table. Much of this is due to the higher memory speed support, which enabled us to run our Kingston HyperX 4GB dual channel kit using Intel's XMP1 profile. This bumped the memory speed up to 2400MHz, from the default speed of 1600MHz. As the benchmarks show, this delivered precisely 50% faster memory performance in our synthetic memory test, which flowed on to deliver between 10% and 20% better performance in our gaming and system benchmarks.

Two more SATA 6Gbps ports are included, delivering a total of six, while the USB configuration also sees an extra two USB 2.0 ports, with a total of six USB 3.0 and six USB 2.0. The audio has been improved dramatically as well, alongside the better Realtek

ALC1150 chip is a headphone amplifier, powerful enough for 600 Ohm headsets.

There's also another expansion slot to go with the single PCIe 3.0 x16 slot, in the form of a half mini-PCIe slot. It's filled with a WiFi 802.11ac/Bluetooth 4.0 card, which plugs into an external antenna for blazing 2.4GHz/5GHz wireless connectivity. There's also another video output, in the form of a full-sized DisplayPort.

At just \$50 more, it's really quite remarkable how many extras ASRock has been able to include. It might not have quite the fastest performance, but this is a fantastic product for those looking for a mid-range Mini-ITX machine.

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

The perfect board for those who don't want to compromise on features, yet don't want to burn a hole through their pocket.





apc
RECOMMENDS

\$335 | WWW.ASUS.COM/AU

ASUS MAXIMUS VI IMPACT

Gaming greatness in a tiny package.

If you're serious about building a high-end gaming rig that can fit into your girlfriend's handbag, look no further. It might be the most expensive Mini-ITX board on the market, but there's a good reason why.

We expected fast benchmark scores, as this board uses Intel's high-end Z87 chipset to deliver stratospheric performance. However, closer examination reveals ASUS cheats a little by overclocking the CPU when it's in Turbo mode, which explains the extra performance.

The added goodies make this board's price much easier to swallow. Most notable is the Impact Power add-on board that sits near the CPU, accommodating ASUS' Extreme Engine Digi III power management circuitry, guaranteeing stable overlocks courtesy of the 8+2 phase power delivery. Then there's the SupremeFX add-on soundboard, which includes the ASUS SupremeFX audio chipset, delivering a claimed 115dB SNR. We tested this with audiophile grade headphones and were blown away by the perfect sound clarity, helped no end by the EMF shielding

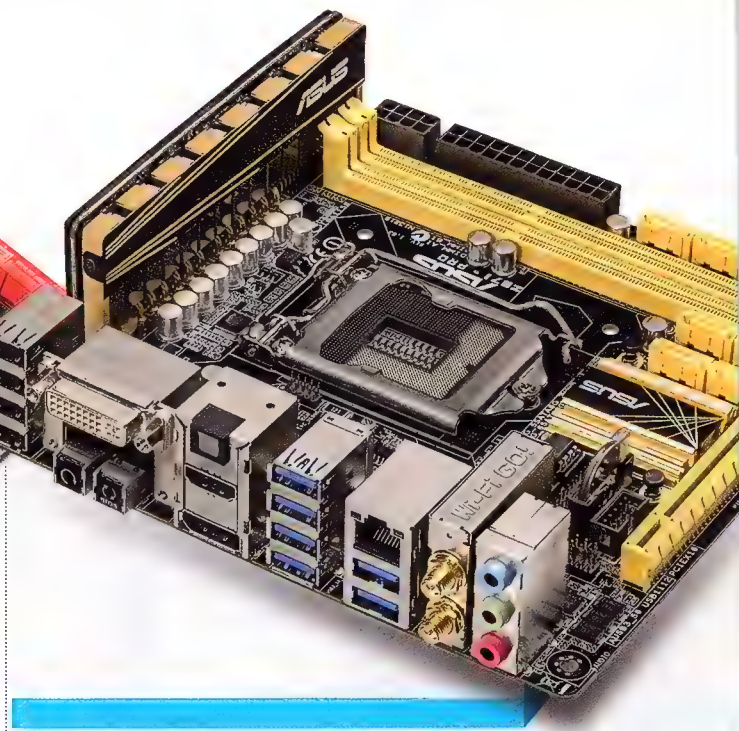
and amplification built into the sound board. Finally there's the mPCIe Combo II card, which packs both 802.11ac and Bluetooth 4.0 RF connectivity. Even with all of these cards in place, there's still room for a single full-sized graphics card, making this the perfect base for a high-end, miniature gaming rig running an overclocked CPU. Sadly there are only four SATA 6Gbps ports; another two would have been nice.

It might be more expensive than most full-sized motherboards, but ASUS has achieved the impossible, stocking this miniature motherboard with more features than most full-blown ATX products. Perfect for the power PC gamer.

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Cashed-up gamers need look no further, as the ASUS Maximus VI Impact offers everything they could ever need.



\$200 | WWW.ASUS.COM/AU

ASUS Z87I-PRO

Aimed at overclockers.

We're not sure why overclockers would ever consider the tight confines of the Mini-ITX format when it comes to breaking their next world record, as the tiny size of the board makes extreme cooling a nightmare to set up, but ASUS has just the board for those crazy enough to try and attempt it.

The Z87I-PRO is packed with overclocking features targeted at the mainstream, which also makes it largely irrelevant for the mainstream, unless you're genuinely paranoid about the quality of your CPU's power supply.

The key feature on this Z87-powered product is the add-on power board which sits to the north of the CPU socket. This is stocked with a 12+2 DIGI+ VRM, making it the most potent overclocker of all the Mini-ITX boards we've seen.

The clean power supply is backed up by the deepest BIOS we've seen in the category, with a plethora of tweaking options that will baffle all but the most educated tweaker.

Four fan headers are included to help keep this tiny

furnace cool while it's running over spec.

A couple of special buttons on the I/O port also illustrate this board's overclocking intentions, one resetting the BIOS, the other allowing a BIOS flash via USB.

Helping to soften the blow of the \$200 price tag is the integrated Wi-Fi, though it's sadly limited to 802.11n instead of the 802.11ac found on cheaper boards.

Other than these features it's a relatively standard Mini-ITX board. If you're an avid overclocker who wants to try tweaking something different, the Z87I-PRO is aimed at you. The rest of us will be able to find much better offerings elsewhere.

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Aimed at overclockers, the rest of us won't use any of this board's specialised features.





\$140 | WWW.GIGABYTE.COM.AU

GIGABYTE GA-H87N-WIFI

Exceptional value for money.

It might not be quite as cheap as the most affordable board in our roundup, but the H87N-WIFI isn't far off. At \$140 it's definitely classed as a budget product, making a few of the included features all the more remarkable. If only the experience of using it matched them.

Once again we see the value-oriented H87 chipset wheeled out to do the heavy lifting, helping to keep costs down while limiting the top memory speed supported to 1600MHz. Accordingly the benchmark results weren't exactly amazing; in fact this board actually came dead last in our PCMark 7 test. What's worse is that it wouldn't even run the 3DMark graphics test, crashing every time we tried. We checked the BIOS multiple times for any strange settings, but couldn't find anything amiss, and even a clean install of Windows 7 didn't help.

It's a shame, as the board offers great value for money. For starters, it includes a dual Intel 802.11n Wi-Fi/Bluetooth 4.0 mini PCIe module, which plugs into a mini PCIe slot. It also includes dual Gigabit

LAN ports, one driven by an Intel chipset, the other by an Atheros component. Video out is also very respectable, with dual HDMI and a single DVI-I, which will make driving three separate displays extremely simple. The audio chipset isn't as crash hot though, using the budget Realtek ALC892 codec, but at least it includes the full five 3.5mm minijack outputs, alongside the usual S/PDIF out.

If only we didn't have so many problems with installing and running benchmarks, this would indeed be our pick of the budget bunch. Hopefully Gigabyte can resolve these issues with a BIOS update, in which case this would make the perfect backbone for your affordable Mini-PC.

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Despite our stability concerns, we think this will make a fantastic budget backbone once Gigabyte irons out some of the kinks.



\$150 | WWW.GIGABYTE.COM.AU

apc
RECOMMENDS

GIGABYTE GA-F2A88XN-WIFI

The Lone (AMD) Ranger.

Welcome to the only AMD board in our roundup. It's not that we didn't want to cover AMD motherboards; instead most suppliers didn't want to send any, as a new range of AMD boards based on the A88X chipset are right around the corner. Thankfully Gigabyte was able to supply us with one for review, but sadly we couldn't benchmark it as we weren't able to get our mitts on a new AMD FM2+ Kaveri APU for testing.

Priced at \$150, it's affordable considering it's basically brand new; you can expect the price to drop in the coming weeks. However, it's relatively feature-light when compared to similarly priced motherboards.

A 4+2 phase power supply delivers relatively clean power to the CPU, while AMD Eyefinity triple-screen support is provided courtesy of the twin HDMI and single DVI-D port. If you use an AMD GPU alongside the AMD CPU, you'll also be able to CrossFire the CPU's integrated graphics with the discrete GPU. Sadly Realtek's budget ALC892 audio codec isn't as impressive,

implemented in a very basic sense, with no EMF shielding or amplification. It drives a single S/PDIF output as well as five 3.5mm minijacks.

Six USB 2.0 and four USB 3.0 ports is a match for every other board in the roundup, as are the four SATA 6Gbps ports. A mini PCIe slot is included alongside the full length PCIe 3.0 x16 slot, but it's filled with the wireless communication module. This delivers both Wi-Fi 802.11ac and Bluetooth 4.0 support, a nice touch at this price point.

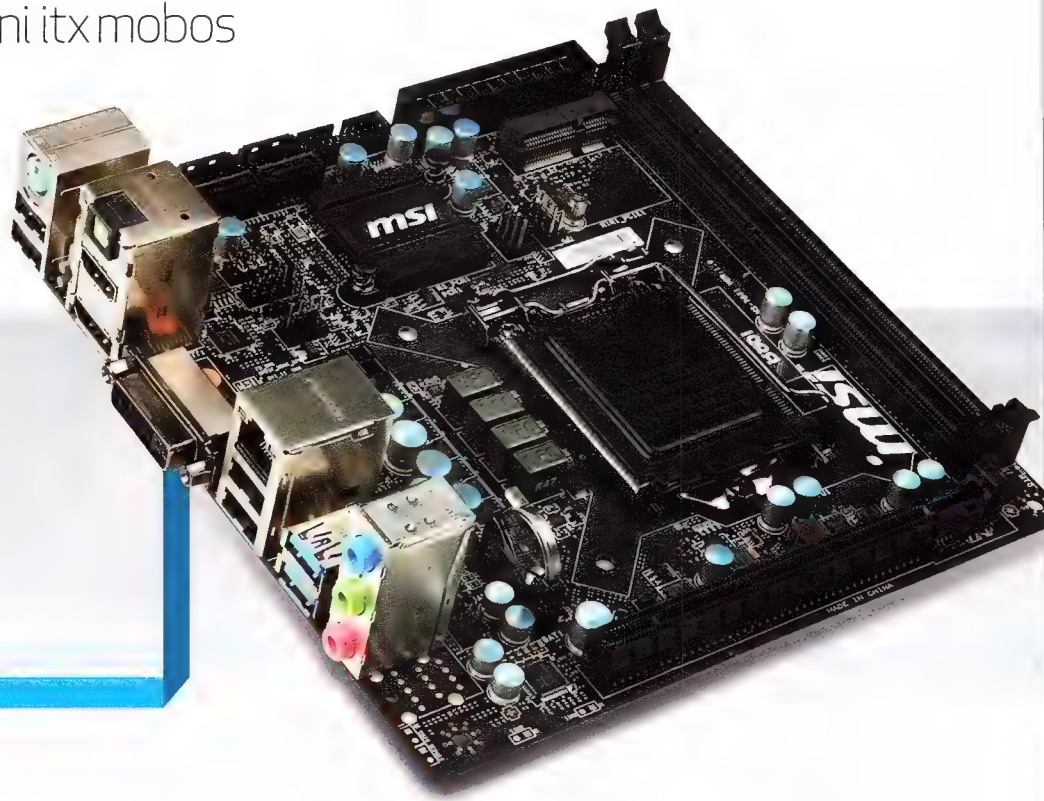
We can't give precise performance results yet, but if the Kaveri CPU meets expectations this could be a fantastic casual gaming platform, thanks to the APU.

Verdict

Features ★★★★★
Performance NOT RATED
Value ★★★★★

The Gigabyte F2A88XN-WIFI should prove to be a very respectable home for your new Kaveri APU, making it a potent platform for a miniature casual gaming or HTPC.





\$115 | WWW.MSI.COM

MSI B85I

As cheap as it gets.

Welcome to budget town, population MSI's B85I. As the model name denotes, this motherboard is built around Intel's affordable B85 chipset. As a result you can forget about any form of high-end memory support, but once again we see a manufacturer hacking overclocking support into a chipset that shouldn't be able to handle it. Not that we'd expect very high overclocks though, as the power regulation is relatively simple by high-end standards.

To our surprise, this board features a mini-PCIe slot, perfect for a combo card running Wi-Fi and Bluetooth, though there isn't one included in the pack. Obviously there's also the usual PCIe 3.0 x16 slot for graphics cards, as well as four SATA 6Gbps ports. Four USB 3.0 connections and six USB 2.0 connections are available, two of each delivered by headers on the board, which will connect to your case's front panel.

The onboard audio can only be described as average, utilising Realtek's basic

ALC892 chipset. This can be output via S/PDIF or the two 3.5mm stereo minijacks. Display output duties are handled by the DVI-I, DisplayPort and HDMI 1.4 ports.

Like our other budget entry, the ASRock H87M-ITX, a budget Ethernet port is included, this time using Realtek's 8111G controller.

We're left with a rather unremarkable motherboard. We do like the option of the mini-PCIe slot, but overall this is a feature-poor product thoroughly outclassed by boards that cost just \$25

more. If you need the absolute cheapest board, go right ahead, but we'd recommend spending that little bit extra for a superior product.

Verdict

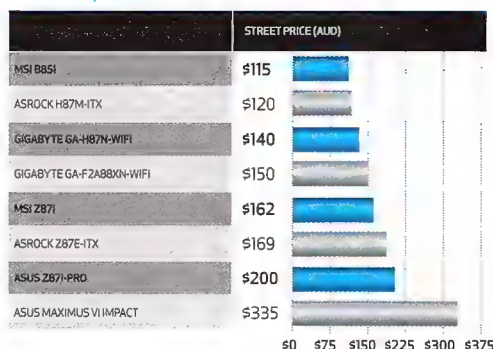
Features ★★★★★
Performance ★★★★★
Value ★★★★★

You pay for what you get, and in this case you really don't get much at all.

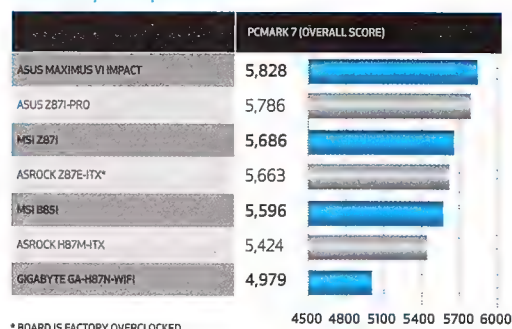


LABS BENCHMARK RESULTS

Price comparison



General system performance





\$162 | WWW.MSI.COM

MSI Z87I

MSI takes on ASRock in a budget deathmatch.

Priced at \$162, this mini-motherboard is going head to head against ASRock's Z87E-ITX.

Both are based on Intel's premium Z87 chipset, and with similar pricing it'll come down to performance and features to determine which one comes out on top. Let the battle begin.

Looking at our benchmarks, we see that MSI's board has the lead in memory performance, and not by a close margin. Unsurprisingly this flows on to our system-wide benchmarks; PCMark 7 saw the two neck and neck, but the MSI board took a lead in the 3DMark gaming test.

Based on pure numbers, the MSI Z87I has the win, but what about features?

To be honest, there's really not much to separate the two. The MSI board has four SATA 6Gbps ports, identical to the ASRock product. It also has an identical number of USB 2.0 ports, at four, as well as six USB 3.0 ports. Even the display outputs are the same, with DVI-I, HDMI and DisplayPort all included. Once again we see a mini-PCIe slot on the MSI, identical to the ASRock, and it too is filled with a wireless communication module. However, on the MSI

board this is a much slower 802.11n/Bluetooth 4 card, which is thoroughly trounced by the ASRock's 802.11c Wi-Fi. The onboard audio of the MSI is also outclassed by the ASRock, including a very basic Realtek ALC892 codec with zero headphone amplification. On the flipside, the MSI board includes twin Gigabit Ethernet ports versus ASRock's single port, though they're both powered by Realtek's 8111G controller.

So there you have it. The MSI is faster, but the ASRock has the edge in both Wi-Fi performance and audio chipset. Which one to

choose depends entirely on what you'll be using the motherboard for; if you're not worried about audio or wireless quality, the MSI gets the nod.

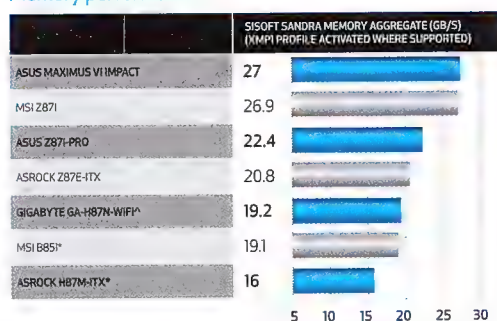
Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

If you value performance over audio and Wi-Fi quality, the MSI Z87I just edges out the ASRock Z87E-ITX.

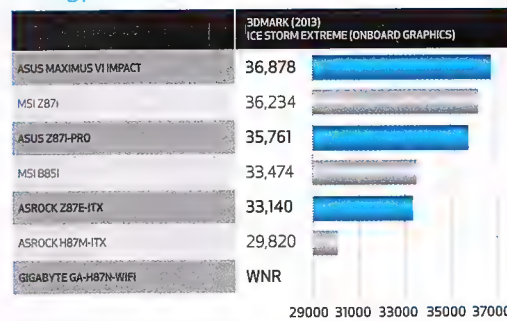


Memory performance



* XMP 1 PROFILE APPLIED THE INCORRECT SPEED SETTINGS, AT 1600MHZ, DUE TO H87. * NO XMP PROFILE ABILITY IN BIOS, DUE TO H87

Gaming performance



WNR = WOULD NOT RUN (CONTINUALLY CRASHED).

29000 31000 33000 35000 37000

PC CASES GO COMPACT

Lindsay Handmer rounds-up 10 of the latest mini-ITX cases that can house anything from slim home-theatre rigs to full-featured gaming monsters.

It used to be that mini-ITX was a form-factor reserved for only a very small class of low-power PCs. But as the motherboards we've reviewed this issue have shown however, nowadays mini-ITX systems can handle the very latest CPUs and even offer support for multiple graphics cards and overclocking. And more recently, there's even been some branching out into the home-theatre PC arena, where you're really looking for a system to be as efficient and quiet as possible, as well as looking good in your lounge room too.

Before shopping for a small form factor case then, it's wise to consider what type of system you

intend to build. Mini-ITX cases are all about a small footprint, whether that's sitting under (or on) your desk or next to your TV.

If you're intending to build a portable system that can be taken with you (to LAN events for example), it's worth pointing out that not all small chassis are designed to be portable. If you want to build a hardcore gaming machine, for example, that may limit your options as you'll need to make sure your chosen case has enough CPU cooler headroom, as well as enough room for your larger-than-average graphics card and power supply.

Despite their small sizes, airflow through a mini-ITX case can still be made quite efficient and many can also handle water cooling kits.

Cases designed for home theatre use are often the most compact and focus on being quiet with good airflow.

A mini-ITX build does come with disadvantages however. Few mini-ITX cases have enough sound management options to accommodate the highest-end parts, so expect some audible noise if you're using those. Most also lack the space for a truly high-end build and can typically only fit a single graphics card. Most 'medium-sized' mini-ITX cases will let you install a regular optical drive, but the more compact ones require a slimline drive. Watch out for extra small or slim cases — they often make sacrifices, such as using an external power supply, which can involve extra hassle and cost.



\$99 | WWW.ANTEC.COM

ANTEC ISK310-150

And the award for snappy name goes to... not Antec..

At first glance this Antec case looks a little like a monster-sized external optical drive from the 1990s. But in reality, this little chassis has room for an entire mini-ITX computer. Measuring just 328 x 222 x 96mm, the Antec is a great option for a miniature desktop PC or HTPC.

It comes with a 150W PSU, but don't expect to fit in a beefy system — you only get a single half height PCI expansion slot and room for a stock or low-slung CPU cooler (like those we've reviewed on page 58).

The 5.25-inch optical drive bay only accepts slimline units and inside you only have bays for 2.5-inch drives — no 3.5-inch drives can be used at all. Cooling is provided by a single 80mm, three-speed fan, though in this chassis that's more than enough to keep the cool air flowing.

Round the front the Antec has dual USB 3.0 ports as well as the standard 3.5mm audio

I/O jacks. You also get an eSATA port, which is handy but not really that essential these days.

The whole case is built from 0.8mm steel so while it's tough enough to sit on, it's also kind of heavy at 3.4kg.

Not surprisingly, the Antec is popular amongst home-theatre PC enthusiasts, as well as those wanting a small, almost silent PC. You can also operate the case on its side, making for a very small and slim tower.

While it's not the most flexible or easy to set up case, for around \$99 online it's a good choice if you want the smallest footprint possible.

Verdict

It's low-cost, compact and has unique looks, but make sure you can deal with the feature compromises.



\$100 | WWW.BITFENIX.COM

BITFENIX PHENOM

Build a stealthily powerful mini PC.

Not everyone wants to stand out from the crowd and the Phenom caters to those who are after clean and modern styling without sacrificing any features. The cube-like Phenom is very compact, measuring just 374 x 330 x 250mm, and has a soft-touch matte surface that blends in without creating reflections.

Despite the small size, the Phenom takes a standard ATX PSU of up to 160mm in length. It can also handle double-width video cards up to 330mm long and has 175mm of CPU headroom. You can even squeeze in a 240mm water cooling radiator along the inside top. It likewise has enough room to mount a standard 5.25-inch optical drive and you get two PCI expansion slots.

In an effort to appeal to the home theatre, DIY NAS and home server market, the Phenom can support a massive 11 (yes, eleven) 2.5-inch drives. Better yet, the drive bays are

all tool free for a quick and easy install or you can remove part of the FlexCage drive bay for more video card room. Cooling is provided by dual 120mm fans.

Like the Prodigy (reviewed on page 54), the Phenom has its I/O ports mounted in the side panel, which is a bit of a pain for positioning as well as opening the case. On the plus side, it has dual USB 3.0 connectors and 3.5mm audio I/O jacks and it comes in both white and black.

If you are after a minimal mini-ITX case with room to build a gaming-capable system, the Phenom definitely has you sorted.

Verdict

Has room enough to build a powerful gaming rig and plenty of user-friendly features, though we're not fans of the side-mounted USB ports.





FROM \$89 | WWW.BITFENIX.COM

BITFENIX PRODIGY

Reminiscent of a tiny Mac Pro tower.

Unlike most mini-ITX cases, the Prodigy comes in a huge array of customisable flavours. For a start, you can get it in black, white, red, green and blue. There are also special shock-protected models, an 'M' version that supports micro-ATX boards and a range of optional coloured panels and side windows.

Externally it's got a 5.25-inch drive bay, dual USB 3.0 ports and 3.5mm audio, though annoyingly the I/O panel is mounted on the removable side panel, rather than the front or top of the case.

Inside it can house a standard ATX PSU, has two 120mm fans, plus two 3.5-inch drive bays and a modular drive cage that supports up to another four 3.5-inch or 2.5-inch drives.

You can squeeze in a 160mm PSU, a 170mm CPU cooler and a 170mm graphics card with the drive cage in, or a massive 310mm card with the latter removed. You can also

fit in a 240mm water cooling radiator.

Elsewhere, there's two PCI expansion slots and the PSU is mounted underneath the motherboard. At 404 x 250 x 359mm the Prodigy is a little larger than some of the slimmer cases, but doesn't feel overly big. The handles at the top are made from surprisingly tough but flexible plastic and make the case very portable, while also adding a degree of shock protection.

The Prodigy is also quite affordable, considering how well it's kitted out and you can pick one up for under \$100.

APC's review unit was supplied by PC Case Gear (www.pccasegear.com.au).

Verdict

Modular, roomy and well laid-out, this is the ultimate mini-ITX gaming case.



apc
RECOMMENDS

\$60 | WWW.COOLERMASTER.COM

COOLER MASTER ELITE 120

The best bang for buck mini-ITX case available?

Stylishly squashed, the CoolerMaster Elite 120 looks much like a mini tower that's been chopped down to just a fraction of its original height.

It's got a single 5.25-inch drive bay, and can support three 3.5-inch drives or four 2.5-inch SSDs inside. It measures 401 x 240 x 208mm while weighing in at 3.3kg. Up top, it's got dual USB 2.0 ports, a single USB 3.0 connector and 3.5mm audio I/O jacks.

While it won't fit in a truly beefy system, the Elite 120 can still squeeze in enough hardware to tackle the latest games, alongside home theatre PC duties.

It can fit a standard ATX PSU up to 180mm long and can handle discrete GPUs up to 343mm – though it has a fairly low 65mm clearance for the CPU cooler.

It does have dual expansion ports, so you can fit in a double width videocard if you so truly desire.

With a full system, airflow will be slightly choked,

though there are enough cable management options to keep things from getting too messy. The 120mm front fan does most of the work to keep your system from catching fire, though the 80mm side fan helps to vent hot air.

Though it probably won't be destined for your living room (unless you want a compact but powerful gaming system in there), the Elite 120 nevertheless offers plenty of features for the price. Shop around and you can find this little ditty for under \$60 – while that doesn't include a PSU it's still an excellent price.

Verdict

About as low-priced as they come, this squashed-looking case is great value, although it's a little tight for space in some areas.





\$130 | WWW.FRACTAL-DESIGN.COM

FRACTAL DESIGN NODE 304

Optical drive bay not included..

With short, black, squat cases competing for attention, the Node 304 has made a bold move to stand out – and we don't just mean selling a white version. To ensure extra build flexibility, the Fractal Design techs have ditched the optical drive bay completely and used the space up front for hard drives and the power supply. While this setup might immediately rule it out for many users, optical drives are admittedly no longer as critical as they once were and for a server or streaming-centric home-theatre PC, this could actually make sense.

In a move that both annoys and pleases us, the 304 uses an entire case shroud instead of side panels. This gives excellent access to the internals when you're building the system, but can be fiddly to refit. Inside it's got two PCI expansion ports, two 92mm front mounted fans and a large rear 140mm fan. Impressively, it can handle up to six 3.5-inch

or 2.5-inch drives, with two in a removable bay. On the side it's got dual USB 3.0 ports and 3.5mm audio I/O, while round the back there's a high/low fan speed controller. The 304 fits standard ATX PSUs up to 160mm long, graphics cards up to 310mm long and at 165mm, has decent headroom for your CPU cooler.

Available in both black and white, the Node 304 manages to squeeze a lot of features into a tiny space. With a street price just shy of \$130, it's again not the cheapest option, but makes for a solid choice if you're looking for an easy and flexible build experience... provided you don't need an optical drive, of course.

Verdict

There's no optical drive bay, but that aside the Node 304 makes for a flexible and well laid-out case... if a slightly pricey one.



\$179 | WWW.IN-WIN.COM.TW

INWIN H-FRAME MINI-ITX

An open case design like no other.

In a world of square box PC cases, the InWin H-Frame dares to be different, with a unique layered open air design. Now keep in mind that the H-Frame is not really for everyday use – rather it's tailored towards those wanting to build a fanless mini PC that looks good enough to display. And we do mean totally fan free – while there is some mesh the Inwin has enough gaps to quickly pick up dust.

Inside it's got a 180W PSU, mini-ITX motherboard mounts and room for a single low profile graphics card. 3.5-inch drives aren't supported – there are only mounts for 2.5-inch drives like laptop models or SSDs. Your optical drive will need to be a slim type too, as there's no room for a standard 5.25-inch bay. Round the front the InWin features dual USB 3.0 ports as well as your standard 3.5mm audio I/O.

To access the inside of the case you unscrew the side panels which then totally

lift off – one of which can be replaced by an included clear side panel to show off your PC internals. Cable management is good, though with only 70mm headroom, a slim CPU cooler is a must.

While the H-Frame Mini doesn't exactly bristle with features, it is quite small at just 287 x 262 x 108mm wide.

While the H-Frame has plenty of substance, it's also got a hefty price tag and is best suited for a use where you can show off its unique style.

APC's review unit was supplied by PC Case Gear (www.pccasegear.com.au).

Verdict

It's unique, small, stylish and comes with a PSU, but the H-Frame is also a little cramped and not particularly flexible.





\$200 | WWW.LIAN-LI.COM

LIAN LI PC-TU200

Build a PC that's also
carry-on luggage..

Looking more like a piece of rugged aluminium luggage than a PC case, you know from the outset that the PC-TU200 is a solid piece of kit.

After triggering the quick release toggles for the side panels, the premium feel is continued inside. You get a separate motherboard tray, SATA hard drive backplate, rubber shock absorbing drive rails and a full-size 5.25-inch drive bay.

You have room for four 3.5-inch drives or two 2.5-inch SSDs as well as two PCI expansion slots at the rear. The space for the PSU is a little squeeze at 140mm, while your CPU cooler needs to be under 80mm, but on the plus side you can fit in a 300mm graphics card. If you want extra room in the case, you can remove the hard drive cage, as there's an extra 2.5-inch SSD mount on the floor of the case.

Cooling is handled by a single front-mounted 140mm fan, though you can add in

extra ones at the top and rear if you are planning a warmer-running gaming system.

On the front you get dual USB 3.0 ports as well as eSATA and 3.5mm audio I/O jacks.

Thanks to the all-aluminium construction, the TU200 only weighs 3.15kg. You can get it in silver or black and it measures 360 x 220 x 320mm.

The Lian Li PC-TU200 is quite expensive at \$200 or so online, but if you're looking for a tough yet stylish (and very portable) mini-ITX chassis, it really has no equal out there.

Verdict

It's costly and a little cramped, but the TU200's portability, light weight and tough build quality make this one stand out.



\$145 | WWW.SILVERSTONETEK.COM

SILVERSTONE FT03B MINI

Reaching for the stars.

Putting a fresh spin on mini PC case design, with the FT03B Silverstone has flipped the case on its end for a tall chassis with a very small footprint. Like the similar full size Raven case, this means the motherboard is mounted 90 degrees compared to normal, which Silverstone claims aids in cooling.

If you're worried about airflow however, rest assured the 1,500RPM 140mm bottom-mounted fan pumps air through the case without appreciable noise.

The FT03B doesn't use a standard ATX PSU – rather it needs an SFX model, which sadly isn't included. Impressively you can fit a 240mm long graphics card that takes up two PCI expansion slots, though you only get a rather meagre 78mm of CPU cooler space. The FT03B has mounts for a single 3.5-inch drive, two 2.5-inch drives and requires a slimline slot-loading optical drive.

Built from 2.5mm

aluminium wrapped around a steel frame, it's rather hefty at 4.7kg, though measures in at a svelte 397 x 235 x 119mm.

The dual USB 3.0 ports and 3.5mm audio I/O connectors are top-mounted for easy access along with the power button. Frustratingly, cabling for power, monitor, keyboards and mice all exit from the top end of the case, which ruins some of the appeal of the minimalistic design.

Considering you need to buy an SFX PSU, the FT03B isn't cheap at \$145. But if you want a unique case with the features and space for a well-equipped mini-ITX build, it's a solid choice.

APC's review unit was supplied by PC Case Gear (www.pccasegear.com.au).

Verdict

A small footprint, solid build and great airflow don't quite balance out the cons: top mounted cables and the need for a SFX PSU and slot loading optical drive.





\$129 | WWW.SILVERSTONETEK.COM

SILVERSTONE PT12B

Designed to blend in with your AV equipment.

When it comes to building a mini-ITX home-theatre box, most of the cases available are compact cubish designs. In an effort to replicate the shape of more traditional Hi-Fi equipment, however, the Silverstone PT12B takes a different tack, effectively squashing the PC hardware flat in a stylish brushed aluminium case.

At just 135mm high, the PT12B does not have room for a normal mini-ITX motherboard – rather, you need one that conforms to the ‘thin mini-ITX’ form factor. Fortunately you can still get some thin models that are beefy enough to accommodate home theatre PC needs. The PT12B is 410 x 265mm – similar to a large DVD player.

Inside you have room for a slim 5.25-inch optical drive as well as a single 2.5-inch hard drive or SSD.

No fans are included, so if you’re planning a powerful system it’d be worth fitting some 80mm models. It will

also need an external power adaptor as it’s too thin for an internal PSU.

There are no provisions for external GPUs either but, that said, the integrated graphics from the latest Intel and AMD offerings are more than capable for multimedia. In what we consider a rather glaring oversight, there are no USB ports on the front of the case – instead you have to rely on your motherboard’s rear-mounted ones, making plugging in external drives a real pain.

If you want to build a very flat home theatre PC then for \$129 the PT12B is an excellent choice, marred only by a few downsides.

Verdict

A flat, stylish and decent-quality case that’s perfect for home-theatre duties, though your motherboard options are very limited.



\$130 | WWW.THERMALTAKE.COM

THERMALTAKE ARMOR A30i

Ready to house a miniature gaming beast.

While it’s a little larger than some of the other mini-ITX cases here, Thermaltake’s Armor A30i has the advantage of being able to handle both mini-ITX and micro-ATX motherboards. With three large blue backlit fans, plenty of extra ventilation and a side window, the A30i seems designed to show off a mini-PC build that still packs a punch.

Inside you can fit a graphics card up to 330mm long and you get four PCI rear expansion ports – so even dual cards is an option. While the A30i takes a standard PSU, it does sit fairly close to the motherboard, limiting you to a CPU cooler that’s less than 90mm high. It’s got both 5.25-inch and 3.5-inch front drive bays, as well as room for two more 3.5-inch drives and two 2.5-inch SSDs. Round the front are both USB 3.0 and USB 2.0 ports, eSATA and your standard 3.5mm audio I/O connectors. The chassis is also quite modular, and you can

easily remove drive bays or even the entire motherboard tray, making it a good base for modding.

With its ‘high power gaming’ focus, it’s a bit of a shame that the A30i doesn’t include a top-mounted carry handle to make lugging it to LANs easier. Fortunately it is still portable, at 456 x 291 x 266mm.

All in all, if you’re after a mini-ITX case that can handle a powerful PC, the A30i is a solid choice. Just make sure you shop around online; though the RRP is \$149 – meaning this isn’t the cheapest mini-ITX case – you can pick it up for a more reasonable \$130.

Verdict

Combines great airflow and is compact enough for lugging to LANs, but there’s limited CPU cooler headroom and no carry handle.



LOW-PROFILE CPU COOLERS

Cooling for tight spaces.



CPU COOLERS

\$29 | WWW.GELIDSOLUTIONS.COM

GELID SLIM HERO

An efficient and very quiet low profile cooler.

Gelid has managed to pack four 6mm heat-pipes into the Slim Hero, despite the whole cooler measuring just 59mm in height – and that measurement includes the fan. Gelid has used a non-direct contact design, which means the heat-pipes pass through the middle of the cooling block rather than forming part of its base. It still rates the Slim Hero as being able to support CPU's with a TDP up to 136W though. It's something we find a little optimistic, but that's its line, and we've got to judge it by that figure.

One thing to be aware of when fitting the Slim Hero to a mini-ITX or even a Micro-ATX board is just how far it sticks out over the RAM slots. There is only a 19mm gap under one of the heat-pipes, so it defiantly helps if you have access to some low-profile memory modules – such as Crucial's Ballistix Tactical LP sticks or Corsair's Vengeance LP range.

The 120mm PWM fan (which operates between 750 – 1,600RPM) also does its job very efficiently. More importantly, for a cooler aimed at the HTPC market, it does the job very quietly, even when pushed hard.

Despite its compact size, the Slim Hero works very well and is only just behind the much larger Thermalright AXP-200 at standard clock speeds. It even manages to keep our test CPU below 100 degrees when overclocked and running at 100 percent – although only just. Just like the other two coolers reviewed here you really wouldn't want to be using the Slim Hero for any hardcore overclocking duties, but then Gelid never claimed you could.

Verdict

You'll want to pair it with LP, memory, but this one's a quiet and efficient performer that's great for HTPCs.



CPU COOLERS

\$TBA | WWW.THERMALRIGHT.COM

THERMALRIGHT AXP-200

An impressive performer.

The AXP-200 will likely not only be the most expensive of the three coolers here, but it's by far and away the largest, too. Thermalright's AXP-200 is the successor to the AXP-100 and is aimed directly at the ITX/HTPC market. It's worth noting from the off that its sheer bulk will restrict it from being used in the most compact solutions. We'd recommend measuring to see if it fits first, though.

The AXP-200 uses six 6mm heat-pipes and like the Slim Hero – these pass through the middle of the cooling block, and don't

use the increasingly more common direct contact design. These heat-pipes and the contact block are made of copper, but the cooling fin array is finished with a nice nickel plating.

As with the Zalman CNPS2X, the AXP-200 makes use of a mobo backplate. Thermalright has made installing it a real doddle, too. The good news is that those annoying patience-sapping wires don't hold the fan in place – it's simply screwed into the cooling fin array.

On that note, the AXP-200 comes with a 140mm fan, but if that isn't enough, you can upgrade it to a 150mm model

LABS BENCHMARK RESULTS

Intel Core i7 3770K at standard clocks

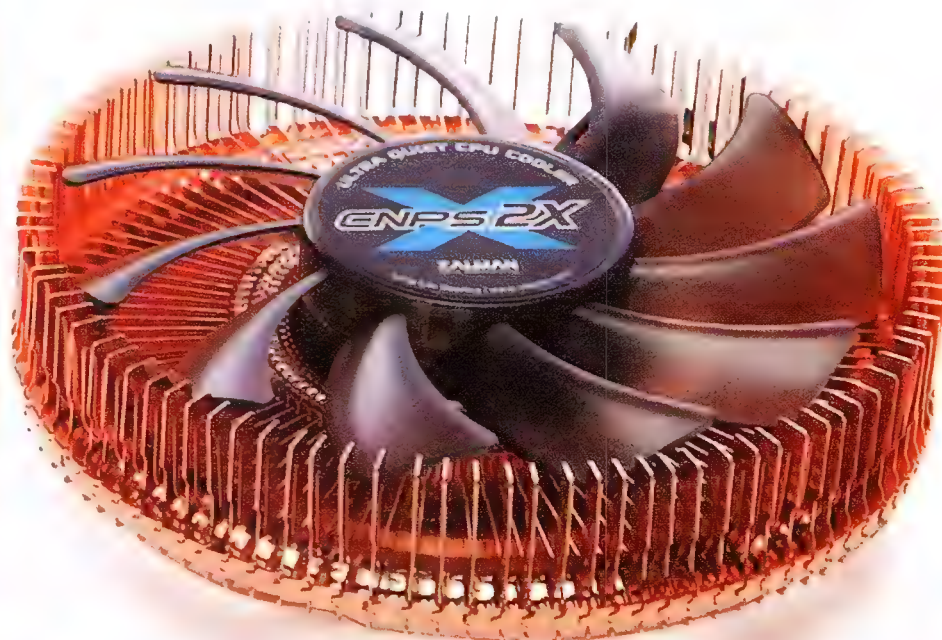
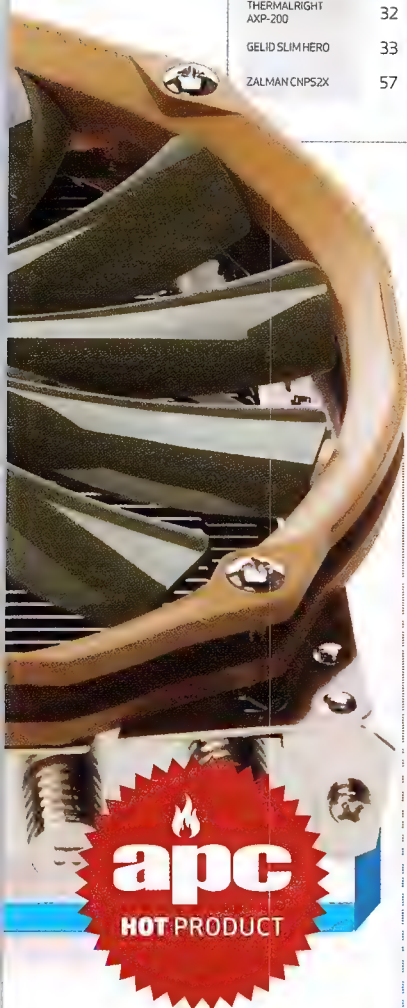
CPU idle	DEGREES CENTIGRADE, LOWER IS BETTER
THERMALRIGHT AXP-200	32
GELID SLIM HERO	33
ZALMAN CNPS2X	57

Intel Core i7 3770K at standard clocks

CPU at full load	DEGREES CENTIGRADE, LOWER IS BETTER
THERMALRIGHT AXP-200	65
GELID SLIM HERO	68
ZALMAN CNPS2X	84

Peak-to-idle performance

Full CPU load	TIME IN SECONDS, LOWER IS BETTER
THERMALRIGHT AXP-200	80
GELID SLIM HERO	70
ZALMAN CNPS2X	49



CPU COOLERS

\$30 | WWW.ZALMAN.CO.KR

ZALMAN CNPS2X

The tiniest tornado.

instead — there's a special mounting plate for the larger fan as well.

Performance wise, the AXP-200 is impressive; it kept our i7-3770K nice and cool, both in idle mode and when the CPU was at 100 per cent load. It works quietly too, thanks to a large PWM controlled fan that spins between 700 and 1,300rpm.

Verdict

The big footprint means it won't suit every system, but it's impossible to fault when it comes to cooling performance.



They say never judge a book by its cover. Perhaps we can offer a new twist on the saying — never judge a cooler by its size. Zalman's CNPS2X is the smallest CPU cooler we've ever seen and could in fact be in contention for the smallest one ever made — it looks better suited to cooling a graphics card than a CPU.

Measuring a mere 27mm high and with diameter of just 84mm, it fits comfortably in the palm of your hand. But don't let its small size fool you — it's rated to cool CPU's with TDP up to a staggering 120W. It's much better suited for use with a small compact system

built around an ITX mobo and a lower to mid CPU.

Typically for a Zalman CPU cooler, the size of this component doesn't stop it from looking like a work of art. The contact plate is made from aluminium and is plated with copper, while the 100 cooling fins and the single 4mm direct contact heat-pipe are made from copper. The heat-pipe has been bent into an 'S' shape, allowing all the cooling fins to connect in one hit. Sitting in the middle is one of Zalman's own 80mm PWM cooling fans, spinning between 1,500 and 2,600RPM.

So it looks the part, but how does it perform? Well

to be honest, not that well. Although Zalman give the CNPS2X a rating of 120W TDP, it really struggles to cool a CPU adequately anywhere near this. Our test i7-3770K has a TDP of a mere 77W. When we pushed the CPU to 100 per cent, the CNPS2X really struggled.

So maybe you can judge a cooler by its size after all...

Verdict

Proof positive that a small cooler can still perform well, but it's perhaps not suited for use with high-end CPUs.





Letting off Steam

Darren Yates **configures two quiet mini-ITX desktop systems to take advantage of Steam's growing world of entertainment.**

Valve's Steam maybe synonymous with gaming, but the company's intense dislike for Windows 8 has evolved into an aggressive expansion strategy involving Linux as an alternative. With plans for its own SteamOS operating system and PC gaming hardware well advanced, Valve aims to bring its empire into your living room, having already launched Big Picture late last year to create a more social gaming platform.

SteamOS may not be with us yet at time of publishing, but with the 'Big Picture' in mind, we've designed two quiet Steam-ready systems using mini-ITX hardware — one for gaming, the other for movies. We've also sprinkled our descriptions with some lower-cost alternatives.

GAMING BUILD

CASE BITFENIX PRODIGY

We've been raving about this case for a while now, but there are few compact tower cases as stylish or as versatile as the BitFenix Prodigy. Its modular design and size makes it perfect for our gaming build while still giving us decent options in the CPU cooling department. Shop around and you should also pick it up for just this side of \$100.

CPU COOLER NOCTUA NH-U12S

Noctua's NH-U12S is regularly voted one of the best low-noise CPU coolers available, but in the confined space of a mini-ITX case, you need to choose your motherboard carefully if you're to still get access to the PCIe slot. Put simply, we designed this build backwards —

we chose the case and cooler, then the motherboard to fit. The NH-U12S is 158mm tall so it just fits the Prodigy's 170mm height limit, but may restrict the internal optical drives you can install. Alternatively, Noctua's ultra-compact NH-L9i would work here but at the expense of thermal efficiency (meaning higher CPU temps) and higher noise levels at full fan speed.

PSU SEASONIC G550 80PLUS GOLD

Seasonic is our go-to brand for tough-as-teak performance power supply units and the new G550 delivers gold-standard efficiency, pushing 90%. Seasonic PSUs are already among the quietest around, but this efficiency level should see it use less power and produce even less noise. Its 550W output is a perfect match for the GTX 760 graphics card, but its physical size is on BitFenix's recommended limits — it'll fit the Prodigy case, but only just. The anchored cables help here.

GRAPHICS CARD ASUS GTX 760 DIRECTCU II

The GeForce GTX 760 takes over the GTX 660's mantle as Nvidia's mainstream performance card, but we've gone for the ASUS DirectCU II version for its low fan noise. This is one of the quietest performance cards on the market. It'll fit in our case-of-choice, the BitFenix Prodigy, but you need to remove the top drive cage. The top-mount PCIe power connector may also further limit your internal optical drive options.

HTPC BUILD

CASE SILVERSTONE ML05

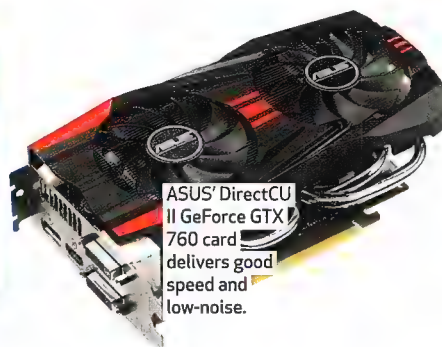
An HTPC build needs more of a 'home entertainment' case option, so we've gone with Silverstone's new compact ML05 desktop design. It's a tiny case, about the size of an old VCR but with enough room for four 2.5-inch drives. It needs a small form factor SFX PSU and low-profile CPU cooler but, the compact design should fit any living room.



BitFenix's Prodigy, one of the more stylish mini-ITX PC cases.



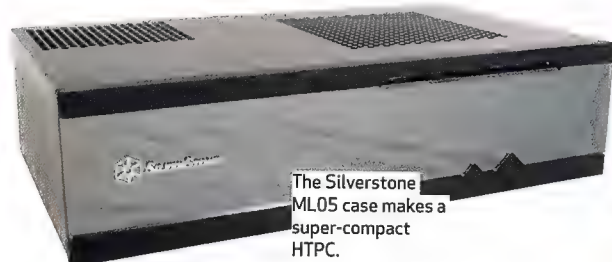
Intel's low-power Core i5 4570S quad-core chip, ideal for quiet systems.



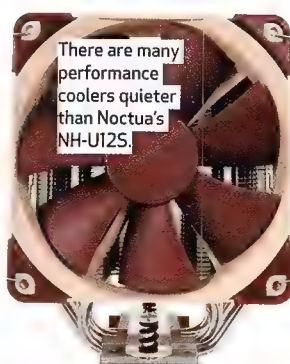
ASUS' DirectCU II GeForce GTX 760 card delivers good speed and low-noise.



Western Digital's 2.5-inch 1TB Blue drive should give the right mix of speed, price and low-noise.



The Silverstone ML05 case makes a super-compact HTPC.



There are many performance coolers quieter than Noctua's NH-U12S.



ASRock's Z87E-ITX is loaded with excellent features at a budget price.

COOLER NOCTUA NH-L9I

Low-profile cases do look great in a living room but they also provide added challenges. The most pressing with the ML05 is the need to take care with CPU cooler height, given the case is only 99mm tall. But at just 37mm high, Noctua's NH-L9i will easily fit inside on top of our chosen Core i5 4570S CPU and still leave room for a slimline optical drive if you want. It's not as thermally efficient as the NH-U12S but we don't have a choice here. Just make sure you get the L9i (Intel) version. Incredibly, it has room for up to six 2.5-inch drives.

PSU SILVERSTONE ST45SF 450-WATT SFX

Silverstone's own ST45SF SFX PSU is a good match for the ML05 case. Its 450W output is overkill for this build, but that'll help it stay quiet. It's designed for 24/7 use, so expect reliable performance, too. Given the space restrictions here, the anchored cables are again a plus.

BOTH BUILDS

PROCESSOR INTEL CORE I5 4570S

The enemy of silent is heat, so the right compromise between CPU performance and power consumption is important here. The S-version of Intel's Core i5 4570 has a thermal design power (TDP) rating of 65W, 19W less than the standard model but still delivers decent quad-core speed, despite a lower 2.9GHz stock clock.

MOTHERBOARD ASROCK Z87E-ITX

What makes building a silent mini-ITX gaming system difficult is getting the right combination of CPU cooler that still allows access to the board's PCIe slot. That limits your board choices and for us,

ASRock's Z87E-ITX is the best option. Loads of extras including dual-band 802.11ac Wi-Fi and Bluetooth 4.0, triple-monitor support and a low price make this an easy board to choose. The only caveat is that there's only one chassis fan power header. However, it'll handle Noctua's NH-U12S cooler (just make sure you use a rev 1.5 or 2.0 backplate) and still gives access to the PCIe slot.

ALTERNATIVES

Gigabyte's GA-H87N-WIFI is a lower-cost \$149 alternative but only has one chassis fan power connector and single-band Wi-Fi. You'd also need the NH-L9i cooler to get access to the PCIe slot.

ASUS's Z78I-PRO with dual-band 802.11n Wi-Fi is worth considering if you want more chassis fan connectors; it has three versus the ASRock's one. However, it's quite a bit more expensive than either of the other options here.

SSD 240GB SANDISK EXTREME II

Sandisk's 240GB Extreme II isn't one of the cheaper 240GB or so SSDs going around, but it's still decent value with excellent read/write speeds, particularly at 4K levels. There are plenty of lower cost options like Samsung's 840 EVO (although, I'm not a fan of TLC NAND-based SSDs). Kingston's HyperX 3K is an excellent alternative as well.

HDD 1TB WESTERN DIGITAL BLUE WD10JPV

The price premium of 2.5-inch hard drives over their 3.5-inch desktop siblings is quickly evaporating, but nevertheless, the smaller form factor makes a good choice here for low-cost bulk storage that's compact, power-efficient and quiet. WD's Blue grade drives are faster than the Green offerings but run quieter than the performance Black versions. Use the SSD for your OS and games and this drive for bulk media storage.

SUGGESTED MINI-ITX STEAM PC BUILDS

COMPONENT	GAMING	COST	HTPC	COST
CPU	INTEL CORE I5 4570S QUAD-CORE	\$240	INTEL CORE I5 4570S QUAD-CORE	\$240
CPU COOLER	NOCTUA NH-U12S	\$75	NOCTUA NH-L9I	\$55
MOTHERBOARD	ASROCK Z87E-ITX	\$169	ASROCK Z87E-ITX	\$169
RAM	8GB DDR3-1600 (STANDARD HEIGHT)	\$80	8GB DDR3-1600 (STANDARD HEIGHT)	\$80
GRAPHICS CARDS	ASUS GEFORCE GTX 760 DIRECTCU II	\$329	(INTEGRATED)	\$0
STORAGE - SSD	240GB SANDISK EXTREME II	\$255	240GB SANDISK EXTREME II	\$255
STORAGE - HDD	1TB 2.5IN WESTERN DIGITAL WD10JPV	\$95	1TB 2.5IN WESTERN DIGITAL WD10JPV	\$95
OPERATING SYSTEM	MICROSOFT WINDOWS 8.1 (64-BIT INSTALL DVD)	\$109	MICROSOFT WINDOWS 8.1 (64-BIT INSTALL DVD)	\$109
CASE	BITFENIX PRODIGY	\$99	SILVERSTONE ML05 DESKTOP HTPC CASE	\$59
PSU	SEASONIC G550 80PLUS GOLD 550-WATT	\$120	SILVERSTONE ST45SF SFX 450-WATT	\$99
TOTAL COST		\$1,571		\$1,161



You can't get any quieter than an SSD — Sandisk's Extreme II SSD.



One of the more efficient PSUs on the market, Seasonic's new 550W G550.



Noctua's NH-L9i is one of the lowest profile CPU coolers around.

See the big picture

Built a lounge room PC? Darren Yates shows how to auto-boot Windows 8 straight into Steam or XBMC and create shortcuts for the other.

Home-theatre PCs are great until you have to start manually launching apps within Windows and moving a mouse around to find some tiny launch icons – that seriously defeats the purpose if you're supposed to be relaxing with your big screen TV. The good news is you can bypass Windows completely and boot straight into your choice of XBMC or Steam's Big Picture Mode using a couple of software tricks. What's more, we'll show you how to create shortcuts for the other app inside your boot app, so you can launch XBMC from within Steam, or Steam from inside XBMC.

Which one you choose is up to you and the mini-ITX system build you chose. But really, you can perform these software tricks on any system – all you need is at least Windows Vista or Mac OS X 10.7 (Lion) and a 256MB graphics card with at least support for DirectX9 and PixelShaders 2.0b.

Step-by-step: Auto-launch Big Picture at boot on Windows 8.1.

Jump straight into Steam at start up.

1

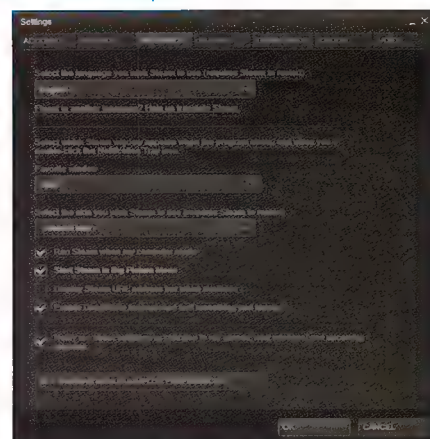
PREPARE

Install Steam, sign into your account. If you don't have one, create one.

2

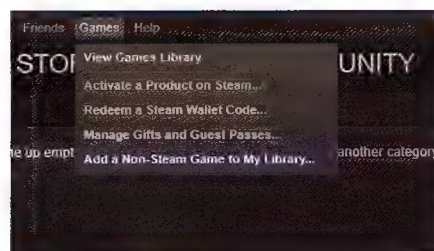
CONFIGURE

When the Steam app opens, go to the top menu and choose 'Steam > Settings' and select the Interface tab. Ensure the checkboxes next to 'Run Steam when my computer starts' and 'Start Steam in Big Picture Mode' are ticked. Click the OK button. The next time you reboot, Steam should automatically launch and go straight into Big Picture. (And yep, it works on Windows 8.1.)



Step-by-step: Big Picture XBMC launcher

Add XBMC to your Steam account.



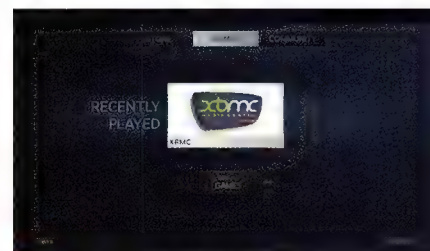
1 INSTALL XBMC

Make sure you have XBMC already installed (get it from xbmc.org/download/), start Steam in normal mode and from the main menu, select 'Games > Add a Non-Steam Game to My Library'.



2 ADD SELECTED PROGRAM

Steam's 'Add a Game' window will auto-populate with options and should find XBMC if you've installed it in the default Program Files folder location. Tick the checkbox next to it and press the 'Add Selected Programs' button.



3 READY TO LAUNCH

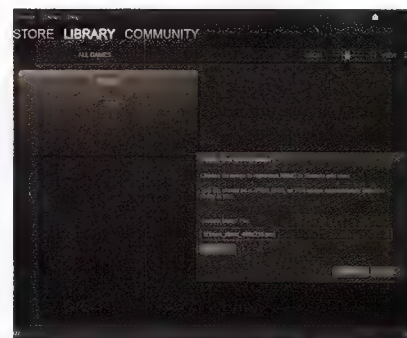
Click on 'Big Picture Mode' at the top right of the Steam app, click on Library and you should see your XBMC launcher appear.

OPTIONAL: CREATING A CUSTOM LAUNCHER IMAGE

However, Steam will simply grab the tiny executable icon as the launcher image – but you can create your own custom icon like we've done here. You'll need some skills with an image editor like Paint.net (getpaint.net) or Photoshop – we'll leave that for you to sort out, just make sure your image is 460x215-pixels in .png, .jpg or .tga. Here's how to add it to your launcher.

4 ADD TO LAUNCHER

Start Steam in normal mode, select 'Grid View' (top right). Right-click on the XBMC launcher and choose 'Set Custom Image' from the context menu. When the 'Set Custom Image' window appears, click the Browse button, locate your image and press OK. When you come back to the Set Custom Image window, press the 'Set Image' button and it'll change. Note that you'll only see this image in Steam's Grid View or in Big Picture Mode.



Step-by-step: Auto-launch XBMC at boot on Windows 8/8.1

Set XBMC to auto-launch on start up.

AUTO-BOOTING INTO XBMC

Of course, the alternate option is to boot up your computer straight into XBMC and create a short-cut or launcher for Steam within XBMC. Essentially, there's no difference in functionality — it comes down to personal choice and which app you prefer to start with.

As with auto-launching to Steam, you have to set Windows for automatic login into your desired account.



1 DOWNLOAD LAUNCHER

Head online to tinyurl.com/ozunpz6 and download XBMC Launcher. Install it in standard mode and allow it to create shortcuts to your Start menu. Fire up XBMC Launcher GUI and on the Startup Settings tab, make sure the checkbox next to 'Start XBMC when Windows starts' is ticked.



2 CHANGE YOUR DEFAULT

Click on the Shell tab at the other end and tick the box next to 'XBMC Launcher'. This will automatically set XBMC Launcher as the default start shell in Windows, bypassing the Modern UI and desktop altogether, starting XBMC sooner. When you exit XBMC, you'll come back to the Windows desktop as normal.

Step-by-step: Create a Steam launcher in XBMC

Creating a Steam shortcut in XBMC is a little more complex than an XBMC shortcut in Steam, but just needs a little Notepad jiu-jitsu. Here's how you do it:



1 GET READY

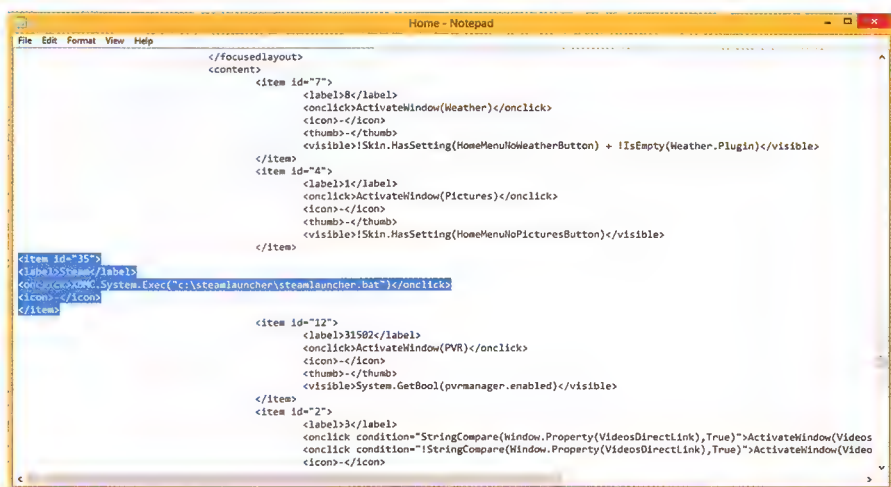
Create a folder called 'steamlauncher' in your C:\ drive (c:\steamlauncher), fire up Notepad, add the following text all on one line and save it as 'steamlauncher.bat' in the 'steamlauncher' folder:

```
taskkill /f /im xbmc.exe &
start /wait "c:\program files
(x86)\steam\Steam.exe" "steam://
open/bigpicture" && cmd /c "c:\
program files (x86)\xbmc\xbmc.
exe"
```

This first force-kills the running XBMC, launches Steam in Big Picture mode and waits until it closes, then launches XBMC again. We're assuming you've installed both Steam and XBMC in their default locations. Also, if you're using 32-bit Windows, remove the '(x86)' references in the text above.

2 GET SET

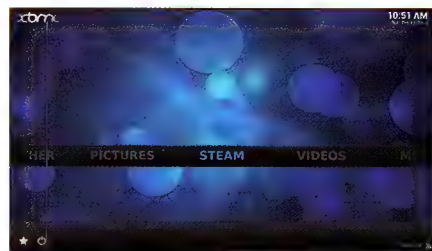
You need to be using XBMC's default Confluence theme, so head to c:\program files (x86)\XBMC\add-ons\skin.confluence\720p folder, copy home.xml to your Documents folder and rename it homeORIG.xml there. Now open the original home.xml file in Notepad. Do a search for 'ActivateWindow'. The first result should be towards the end of



the file surrounded by <item id="xx"> commands. Create a new line after a </item> command and add the following text, each on a new line:

```
<item id="35">
<label>Steam</label>
<onclick>XBMC.System.Exec("c:\
steamlauncher\steamlauncher.
bat")</onclick>
<icon></icon>
</item>
```

Save the file to your Documents folder and copy it to the \XBMC\add-ons\skin.confluence\720p folder, replacing the original (you will need admin rights to make the change).



3 GO!

Launch XBMC manually and you should now see a new Steam command on the main menu. Click on it, XBMC should shut down and Steam launch. When you exit Steam, XBMC should fire up again.



LOUNGE ROOM-READY ACCESSORIES

Building a mini-PC for the lounge room? **Lindsay Handmer** reveals the accessories that'll make it easy to control from the couch.

Lounge room PC peripherals are a varied bunch. They can range from the simple and cheap to the complex and expensive, depending on your use. The almost universal accessory is a keyboard with built in trackpad. This lets you navigate windows, browse the net and type when needed. But even keyboards come in a range of sizes. For infrequent use, pocket sized models take up little room on your coffee table but can still enter the occasional URL or search on YouTube. Larger keyboards are more like a laptop and are comfortable enough for things like typing out emails and using instant messaging they also often have larger trackpads. Some people even prefer to use a full sized wireless keyboard and mouse on their coffee table.

Of course, you can also go smaller and simpler, with keyboard free remote controls that are designed to work with a media player interface, as well as handle controlling your other devices.

Gaming is also important to consider, as your home-theatre PC (HTPC) can compliment your consoles, giving a wider range of titles. Console style controllers are common, but you can find everything from wireless racing setups to motion control too.

HTPC peripherals are not just about input, and you can get a range of technologies that improve the overall experience. Intel's WiDi makes it possible to wirelessly stream content to a TV in another room, or makes it easy to install a projector without extra wires. As always, it's important to plan ahead and consider your intended use, especially if you plan to use it for gaming.

REMOTE CONTROL

\$60 | WWW.LOGITECH.COM

LOGITECH HARMONY 650

The ultimate budget friendly HTPC remote.

A keyboard and mouse might seem like a HTPCs best friend, but if using Windows Media Center you can get total functionality with just a remote control.

The Harmony 650 is a marvel of simplified controllability – you plug it into your PC to program, then it can control your HTPC as well as up to 5 devices such as your TV, stereo and DVD player. Keep in mind you will need a separate IR receiver for your HTPC if it does not already have one.

The 650 has a colour screen, programmable buttons and its backlight automatically lights up when you pick it up.

Just \$60 from a range of retailers, the Harmony 650 is one of the best value remotes out there.

Verdict

It's an older model, but this is a nicely affordable, programmable Windows Media Center-ready remote.



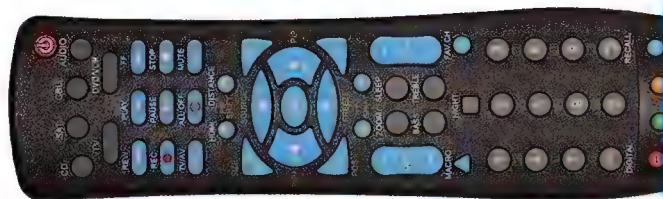


WIRELESS DISPLAY MIRRORING

\$89 | WWW.NETGEAR.COM

NETGEAR PTV3000

Take your living room totally wireless.



REMOTE CONTROL

\$34.95 | WWW.JAYCAR.COM.AU

JAYCAR UNIVERSAL REMOTE

Add instant extra functionality to your home-theatre PC.

This remote can control your TV, DVD player and other devices as well as learn commands directly from your other remotes, though can only control two devices at once. Flip it over and you will find a full QWERTY keyboard that makes it easy to enter URLs, passwords or search for specific YouTube videos.

Rather than a trackpad, the remote has what Jaycar calls optical finger navigation. Kind of like a tiny trackpad the size of a single button, the accuracy is not the best but

with a little practice it's quite usable. The remote comes with an IR USB receiver and works with no software on a Windows PC.

Not only is the Jaycar remote cheap, you can walk into any store and grab one for \$34.95.

Verdict

Covers the basics with learning capacity, a keyboard and a USB receiver, though it's a little small with a fiddly trackpad.



Having to physically locate your HTPC near your TV or running long cables is a pain. Netgear PTV3000 lets you cut the cord and stream 1080P video and 5.1 audio with Intel's WiDi to any display with an HDMI port. Smaller than a pack of cards, the PTV3000 can power from your TV's USB ports, making it perfect for a HDMI cable free wall mounted TV. With a wireless keyboard your HTPC can be located in another room, or feed video to a second TV in the bedroom. It's also perfect for connecting a projector without the world's longest HDMI cable.

Setup is relatively easy – plug in the PTV3000, install the Intel WiDi software on your PC, connect to the adaptor via Wi-Fi and punch in a PIN. From there your PC screen will be duplicated on your TV. WiDi doesn't like interference, but we had no issues streaming from the next room, though much

further caused issues. You can still use the internet on your HTPC while streaming but the bandwidth available is fairly limited. We also noticed a sizeable delay, so while it's fine for video, gaming is a no go.

While many of the latest laptops support WiDi, make sure your HTPC motherboard does as well. Many of the latest phones and tablets can also connect, duplicating your phones screen on your TV and playing video or viewing your images.

Considering you can pick up the PTV3000 for under \$70, it's a must have upgrade for any serious HTPC setup.

Verdict

It's easy to set up and, when supported, works adequately – though it's not fast enough for gaming and older (and non-Intel) laptops won't work.





KEYBOARDS

\$39 | WWW.KOGAN.COM.AU

KOGAN DELUXE WIRELESS KEYBOARD AND TRACKPAD

Perfect for compact dual handed use.

The Kogan keyboard is almost pocket sized — measuring in at 147mm wide by 98mm deep and 19mm thick. It's got a soft touch plastic shell, which while disconcertingly light at 110g, also has a robust quality feel. The keys are just large enough to peck away at while the trackpad is smooth and accurate. You also get a bunch of media controls as well as a full complement of F keys. The Deluxe has an 810mAh battery that can be recharged via the included USB cable, though no standalone charger is included. It connects via 2.4GHz wireless, and we had no range issues during testing. The Kogan unit can also be used to directly control your Kogan Smart TV, Xbox 360 and PS3.

Verdict

An easy to use, very compact keyboard with decent trackpad and media keys.



\$59 | WWW.LENOVO.COM

LENOVO N5902

An intriguingly different design.

HTPC keyboards can often be a little fiddly to use, so Lenovo squeezed the N5902 into an almost pistol grip shape. Rather than a touchpad, it's got optical finger navigation — like a touch sensitive mouse nubbin. Unfortunately it's quite small and accuracy is pretty low, but with some practice you can get decent results. It's also got a touch sensitive scroll bar. Holding the N5902 in one hand doesn't let you reach all the keys, but it's perfectly shaped to hold in two hands and type with your thumbs. In a strip along the top it's got media controls and the keys are backlit, automatically coming on when you use it. Lenovo claims a 3 month battery life from two AA batteries.

Verdict

The N5902 offers adequate one handed keyboarding, but the buttons are small and the mousing control can be fiddly.



\$79.95 | WWW.LOGITECH.COM

LOGITECH K400

Cheap and cheerful

The problem with cheaper wireless keyboard trackpad combos is that the quality is often lacking to the point where it affects usability. The K400 just the right size to throw on the coffee table for general HTPC duties. It's got a 10m range, uses two AA batteries and a couple of extra function buttons such as power. It also supports Windows 8, has a miniature USB receiver and comes with a three year warranty.

While lightweight, the K400 feels a little plasticity and it's not exactly a pleasure to type on. The small 3.5-inch trackpad is decently responsive and supports multi touch and overall it's a very useable HTPC combo. Ignore the RRP and shop around online as it's often sale — otherwise grab one for around \$45.

Verdict

With a 10m range, multi touch trackpad and light weight, this is an effective — if costly — wireless couch keyboard.



DISC CONTENTS

Issue 396 Dec 2013

Every issue, APC brings you a selection of exclusive full-version programs, entirely free. Here's what you'll find this month:

RECOVER DELETED DATA

Find lost files and securely delete personal data with **Abelssoft FileWing Pro 2013**

Accidentally deleted or lost track of your important personal data? FileWing can recover your deleted files. Just name a folder where you want to resurrect your files and FileWing will do the rest. Based on scientifically proven algorithms, FileWing can also provide several methods to delete your files safely. Recover even damaged files, overwrite free space and filter the result list according to your wishes.



SYSTEM REQUIREMENTS

- A CD/DVD-ROM reader or burner.
- The APC disc is designed for use with up-to-date browsers (for example, Internet Explorer, Chrome, Firefox).
- The interface included on the APC disc requires a JavaScript-enabled browser.
- An internet connection may be required for online registration of software before use.
- The software packages on the APC disc have different system requirements. Software is included on the disc for Windows XP, Vista, 7 and 8.

BEFORE INSTALLING

- Check the disc using a virus scanner complete with the latest antivirus data updates. The DVD was checked before burning, but new viruses are being discovered all the time.
- Back up any important system and data files. It is not recommended that the software contained on these discs be installed on production machines.
- If you have any questions regarding the use of the APC disc, click the 'Help' button at the top of the screen.

USING THE DISC

Insert the disc into a CD/DVD-ROM reader or burner and your web browser should automatically load the interface. If not, launch your web browser and load the default.html file from the root directory of the disc.

HELP

If you have any problems with the APC disc, please visit www.apcmag.com/disc.htm. APC provides no technical support for this disc or any software provided on it.

PLUS!

CLEANING ESSENTIALS TOOLKIT

10 apps to help you keep your system running smoothly.

FULL VERSION WORTH \$19!

RECORD YOUR SCREEN

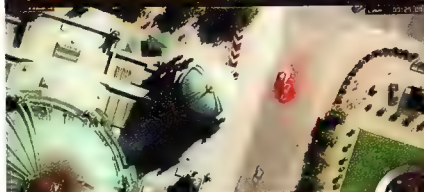


Capture your screen in still images and even record video with **Ashampoo Snap 6**

» **Ashampoo Snap**

6 is the ideal solution for quick screen captures, with the means to record and document anything you see on your screen as screenshot images and video screencasts with audio support. You can create images, tutorials, screencasts and presentations or simply share information with friends and colleagues — Ashampoo Snap 6 is your premier tool to communicate your thoughts and ideas.

PLAYABLE DEMO!



START YOUR ENGINES

Check out the blistering top-down racing action of **Real World Racing**

» *Real World Racing* is a top-down racing game using high-quality aerial imagery that lets you race through the world's greatest cities! Speed through London, Paris, Berlin, Rome and many other cities from a new and realistic perspective in a refreshing take on racing simulations. Sample the action in this playable demo.

FULL VERSION WORTH \$16!

ORGANISE YOUR FILES



Bring order to your data with the easy-to-use **1-abc.net File Renamer 5**

» Are your files all over the place with inconsistent and confusing file names? File Renamer makes organising

and renaming your files easy and even enjoyable. Add as many files as you want to a file list, then change the file positions if required and define what file names should look like. You can include details like today's date and time, file creation date and time, numbers, the original file name, customized text or whatever you want, and a preview feature allows you to see the final file names before you commit to renaming.

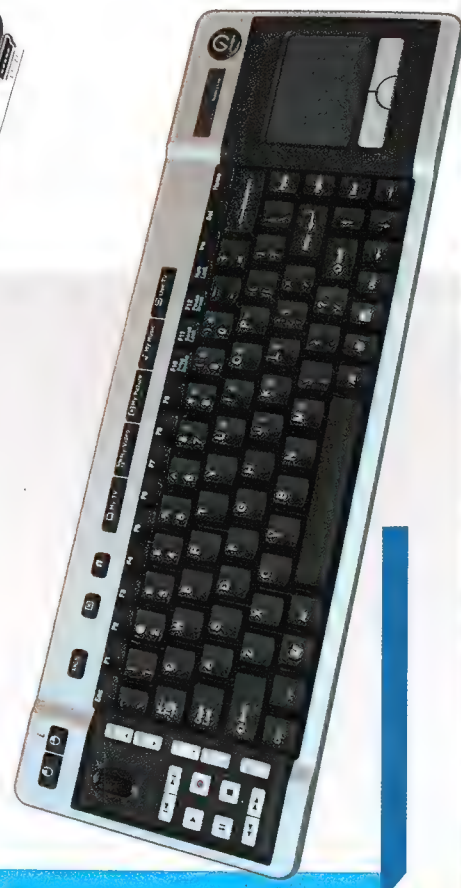
DISCLAIMER Future Publishing is not the licensor of the software and documentation on the enclosed disc (the 'software'). Rather, Future is merely a distributor of the software, and your use of the software is subject to any accompanying third party licence terms. You must carefully read and comply with any such third party licence terms, together with all instructions and README files that come with the software. Accordingly, to the maximum extent permitted by law, all software is provided by Future 'as is' and without warranty either express or implied, and Future will not be liable for any damage that you may incur as a result of using the enclosed disc. You should back up any important system and data files before using the enclosed disc. We recommend that you do not use the enclosed disc on a production machine. Nothing in this disclaimer excludes any warranty that may be implied by statute, which may include the Trade Practices Act. Notwithstanding the foregoing, if the enclosed disc is faulty or damaged, we will replace them for you. While we have taken all reasonable steps to check the enclosed disc for viruses, we cannot guarantee that it is free from viruses or other harmful code and you should check each disc using a virus scanner complete with the latest antivirus updates before use.



\$50 | WWW.ANYWARE.COM.AU



\$94 | WWW.ANYWARE.COM.AU



\$45 | WWW.SHINTARO.COM.AU

RAPOO E9080

Blowing the keyboard competition away.

The Rapoo E9080 is razor thin and incredibly sturdy thanks to a stainless steel back plate. The laptop style scissors keys are actually pleasurable to type on and there is a range of secondary function keys. Most HTPC keyboards skip the numpad, but the Rapoo has an innovative setup where the entire numpad area is a touch sensitive trackpad. Swipe the bottom and it controls your mouse pointer, swipe again and it's a numpad. The trackpad is large and easy to use, though lacks actual mouse buttons. Tapping left clicks, while right clicking is achieved through a three finger tap. While it works well, the problem is that you can't select and drag files or windows. Amazingly, you can buy it for as little as \$50.

Verdict

The razor thin E9080 packs great quality build, with laptop-style keys and a trackpad that doubles as a numpad.



RII MINI I13

Good things come in small packages.

The Mini i13 is an odd piece of tech. Not only is it styled to look like an iPhone, it squeezes in more features than you would think possible. On top it's a learning universal remote that can control 8 different devices and supports macro creation. On the underside, it's got a QWERTY keyboard with easy to press rubberised keys. Instead of a trackpad, it's got an accelerometer that allows it to work as an air mouse and amazingly, it's very accurate and easy to use. And finally, it's got a microphone and speaker so you can use it as a wireless VOIP phone. It has an internal Li-ion battery that can be recharged via USB, as well as a 2.4GHz dongle and a 10m range.

Verdict

This oddball device combines keyboard, air mouse and learning remote in one with (mostly) good results.



SHINTARO WIRELESS MEDIA CENTER KEYBOARD

Larger keys than most makes for easy typing.

The slightly chunky feel and flexible plastic of the Shintaro hide the very capable keyboard beneath. The keys are large and easy to type on, it has a reasonably sized laptop style trackpad and buttons and includes full multimedia controls as well as Windows MCE function keys and a scroll wheel. It even comes with batteries.

It uses a 2.4GHz wireless USB receiver with a 10m range – happily working through walls in our tests. The trackpad boasts 400 DPI, and while it might not be as accurate as the one on your laptop, it does a bang up job. The underside of the keyboard is even moulded to fit your legs, making typing while on the couch surprisingly comfortable. Best of all it's just \$45.

Verdict

Though it's big and a bit plasticky, this makes for a comfortable keyboard for couch surfing.





GAMING GEAR

\$149 | WWW.RAZERZONE.COM



\$59.95 | WWW.MICROSOFT.COM



\$229 | WWW.RAZERZONE.COM

RAZER HYDRA

Can your home-theatre PC replace your Wii for motion-controlled gaming?

Motion tracking control is all the rage with consoles, but remains something of a very narrow niche on PC. In fact, the Razer Hydra is pretty much the only choice. So is it worth the cost? It ships with *Portal 2*, which is supported natively, but can be used with hundreds of different games. We tried *Left 4 Dead 2*, and while the accuracy of the Hydra was very good, motion control won't give you an edge of keyboard and mouse in FPS games. In contrast multiplayer games like *Worms Reloaded* work well on the TV and the controller suits a casual play of old favourites like *Diablo II*.

One of the biggest downsides to the Hydra is the wired controls – it ensures no lag but makes the setup a lot less appealing for the living room.

Verdict

While it does add motion control to some PC games, its wired nature and price make it a tough sell.



XBOX 360 WIRELESS CONTROLLER FOR WINDOWS

Kick back on the couch.

One of the best things about a HTPC is being able to play PC games in the lounge room. Of course a keyboard and mouse aren't exactly easy to use without a desk, but fortunately many PC games do offer gamepad support. The Xbox 360 Wireless Controller for Windows is basically the best of the bunch, especially considering it's available for only \$60 on the street. Getting set up involves installing the controller software on your PC, then plugging the USB dongle in. It rumbles, the 2.4GHz link is lag free and gives a 10m range and it can also connect to your Xbox. If you already have a 360 controller you can buy the PC dongle separately for \$29 online. You can also get a wired controller for PC but, for lounge room use, we'd say wireless is a must.

Verdict

Our first choice for a lounge-room friendly PC gamepad. It's comfortable, well-built and well-supported by games.



RAZER ATROX

Brings arcade-gaming nirvana to the couch.

One of the joys of having a HTPC is being able to play your favourite classic arcade games on the couch. Of course you will need a arcade style controller, and that's where the Atrox steps in. It's equipped with Sanwa Denshi hardware – some of the best known components available. It features 10 tournament grade buttons, as well as a joystick with ball top. Eight buttons are mounted up top in classic arcade style, while another two are mounted to the side. The solid weight of the unit, the smooth operation of the joystick, the satisfying click of the buttons all give a premium feel. It's wired, but comes with a 4m USB cable for easy use in the living room. The Atrox is great for use with your PC, and it's also fully compatible with the Xbox 360 too.

Verdict

It'll only appeal to a select few, but this modding-friendly arcade stick is best in class.



THE ULTIMATE MEDIA PC REMOTE

When it comes to the lounge room PC, standard keyboards and mice are for chumps. *Simon Chester* digs up and compares mobile apps purpose-built for media playback.

Now that your shiny new media PC is all set up, you're no doubt pretty chuffed that you can access every music service, every video service, every single wonderful thing that the boundless internet contains – albeit with a few eye-squints and lean-forwards required. And a stable surface for your mouse. And a place to rest your keyboard. You could fix those by buying a specially-designed keyboard/mouse combo, but there's another option too: with the right apps, you can also use that tiny screen in your pocket to control the whole shebang. Here's a quick look at the major options, as well as how to get started with our favourites.

OFFICIAL XBMC REMOTE

FREE | AVAILABLE ON ANDROID (TINYURL.COM/CG4VQZF) **AND IOS** (TINYURL.COM/LBUN23A)

For fuss-free, comprehensive control of the Xbox Media Center (XBMC) app on your PC, it's recommended to get the official remote. Thankfully, there are versions available for both Android and iOS, but they are developed by different people (the fun of open source), so differ slightly between them. Both, however, offer much the same features: full library browsing, including cover art, media info, and sorting options; a 'remote control' style layout, featuring full media control

including volume; support of multiple XBMC instances, e.g. lounge room + bedroom; live view of currently playing playlist; the ability to keep the screen on while in use; and more.

My favourite feature is effortlessly flicking through the gorgeous artwork of your precious TV shows, movies, and music albums. Be gone, chunky keyboard interface: it's touch time!

Being two different apps with two different developers, there

are a few extra bonus options available to Android users, such as having message and call notifications coming up on your TV screen, as well as pausing media during a phone call.

Setting up should be a breeze: all you have to do is type in the server name (or IP address) of your HTPC, then your password (if you have one set), and you'll be cruising.

Worthy alternative for iOS: XBMC Constellation.



VLC REMOTE

AD SUPPORTED, FREE; AD FREE, \$5.49 | AVAILABLE ON IOS (TINYURL.COM/NNCLSK5)

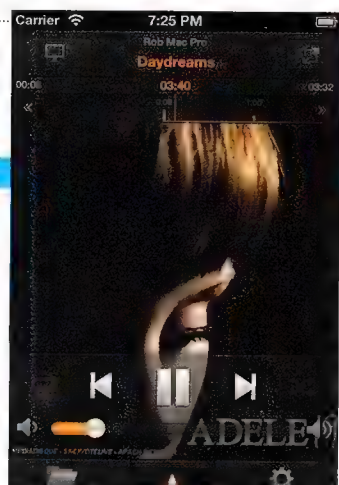
VLC Remote is the app we'd recommend for iOS users, as it's a breeze to set up, and the interface is smooth and intuitive.

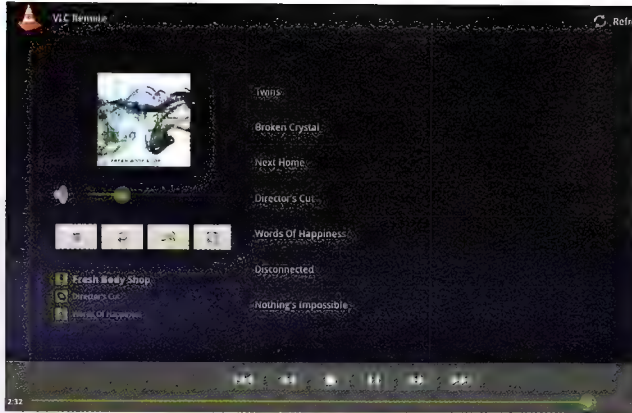
The reason it's so easy to set up is that the app comes with a companion desktop setup program (available for Windows, Mac, or Linux) that flicks all the necessary

switches in VLC and also helps set up your firewall correctly.

But this alone isn't why we recommend it: its slick interface gives you access to everything you need, including the playlist, cover art, even the equaliser; and it's also a universal app, for both iPad and iPhone.

It's a little steep at \$5.49, but you can always try out the free version, and upgrade when you decide that you're sick of ads, or that you want to be able to select which media you wish to play from your home theatre PC.





REMOTE FOR VLC

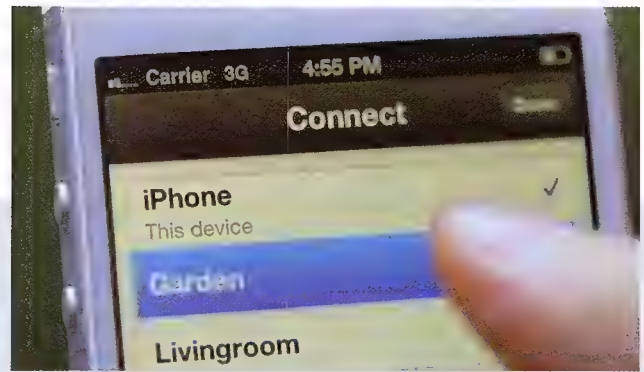
FREE | AVAILABLE ON ANDROID (TINYURL.COM/76TLM4L)

Remote for VLC is my preferred free, open source remote to control my preferred free, open source video player, on my preferred free, open source (largely) mobile OS.

Like VLC Remote for iOS, it runs over VLC's HTTP interface, which means that you have to activate it at start up. Remote for VLC lacks the companion set up app that VLC Remote for iOS comes bundled with, but instructions on how to get VLC to play nice

are available at code.google.com/p/android-vlc-remote/.

Also, like VLC Remote for iOS, it supports both phone and tablet interfaces, but unlike the iOS version, they won't charge you \$5.49 to be able to open the media residing on your HTPC. Caveat emptor: the album art and DVD navigation features are currently labelled as 'experimental.'



SPOTIFY CONNECT

FREE (REQUIRE PREMIUM SPOTIFY ACCOUNT) | AVAILABLE ON ANDROID (TINYURL.COM/6NTAFKB) AND IOS (TINYURL.COM/LP3YROV)

I love Spotify. The relatively paltry monthly fee gives me access to almost any album I can imagine, and stream it to every device I listen to music on (except my old-skool iPod, of course). While I would previously have to manually switch playback between my phone and my PC, a new feature — Spotify Connect — syncs your playback with the cloud, so that you can seamlessly transfer music between any compatible

devices. Additionally, it allows you to use any one device to control another (e.g. the one in your pocket can now control the one attached to your stereo). At the time of writing, it's only available between iOS devices and supported hi-fi hardware, but support for Windows desktop clients (ie the one installed on your HTPC), as well as Android devices, will be coming early 2014.

In the meantime, you can always install Remoteless.

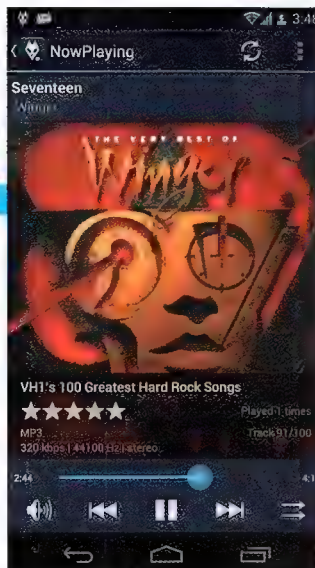
FOOBARCON

AD SUPPORTED, FREE; AD FREE, \$1.33 | AVAILABLE ON ANDROID (TINYURL.COM/LE5OO93)

If you're not into the way that XBMC handles music, or you just want to be able to control your music on your 'other' PC, then you might be interested in getting FoobarCon, which allows remote interaction with my preferred music player, Foobar2000.

Not only does the app give you all the standard playback and volume controls, it also gives you: library search; a file browser; album art; artist bios; lyrics (pro only); wake on lan; incoming call actions, so you can have the music pause when someone calls; widgets; and notification drawer support.

The app requires some Foobar plugins to be installed, but the thoughtful developer has bundled together a



setup app that will install everything required for the remote to work. You can grab the setup app from sites.google.com/site/foobarcon/.

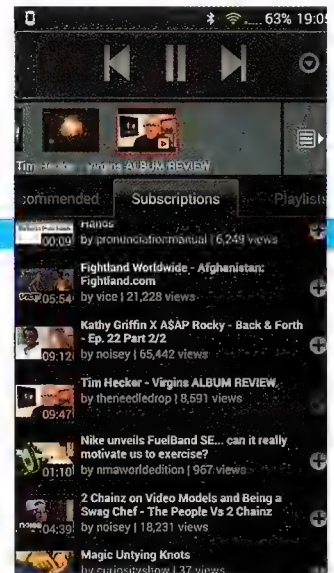
More of an iTunes type? Try Apple's free 'Remote' app for iOS.

YOUTUBE REMOTE

FREE | AVAILABLE ON ANDROID (TINYURL.COM/89MRQLP)

YouTube goes better on TV, and while the official YouTube app allows you to display the video you're watching on your Google TV, there isn't a way within the app to have videos display on your HTPC's browser. Thankfully, it is possible, you just need the official YouTube Remote, and to engage in a little pairing dance.

To start this waltz, navigate to www.youtube.com/leanback on your HTPC. This is a special version of YouTube with a 10' interface — meaning it can be used from 10 feet away using only simple keypresses. First, log in by pressing up or down to find the 'Sign In & Settings' menu and follow the instructions. Then go to the device pairing menu, and open



the YouTube Remote app on your device, agree to the terms and conditions, and press the camera button to take a photo of the QR code. Then you're done! You can preview videos before sending them to your TV screen, as well as pause, skip, control the volume, and manage playlists.

SETTING UP UNIFIED REMOTE FOR ANDROID

Get started with the most thorough remote app out there.

Unified Remote (available on Android and Windows Phone from www.unifiedremote.com) is the most thorough remote application we've ever seen. It does the most basic task of replicating a keyboard and mouse, through to direct control of almost any application, and even allowing you to control attached hardware, like USB/IP IR blasters (including the HTC One's in-built IR!) or home automation. It can even be controlled via NFC (*beep* couch mode ACTIVATE!) and, for the real geeks in the house, it integrates with (the most magnificent) Tasker for Android – meaning you're one step away from total entertainment automation. I get all gooey just thinking about the possibilities.

At its most basic, it's rather simple to set up: you just need to install the client on your handset (duh), and a server on your PC – they'll find each other automatically over Bluetooth or Wi-Fi. The client currently runs on Android 1.5+ and Windows Phone 7+, with an iOS version in the works. The server is Windows only, but Linux and Mac are also being worked on. I'd recommend forking out the few dollars for the paid version, as it supports a host of other goodies – including widgets, 'quick actions' in your notification drawer, and voice control – on top of the plethora of custom remotes that make this app so good.

And there really is a tonne of 'em – just take a look at the list on the Play/Windows Phone Store. There isn't an app I can think of that can't be controlled directly from Unified

Remote – but, even if there is, you can program your own custom remotes and actions using C# or VB (if you're that way inclined).

To choose a remote to use, just select the Remotes icon from the main screen, where you'll be greeted with a rather comprehensive – and equally as long – list of remotes. You can whittle down this list by visiting the Preferences icon, and 'Visible Remotes'. Simply de-select the ones you don't need.

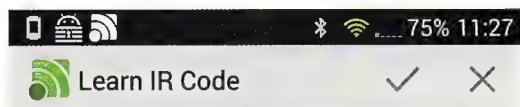
You'll also notice an option in the preferences menu to select 'Quick switch' remotes – choose your most common remotes here, and you'll be able to switch between them using a swipe, rather than having to back out of the remote, then choose the other one from the list.

You can also choose which buttons you want to appear in your notification drawer by visiting the 'Quick Actions' section.

Widgets are another feature that makes Unified Remote just so darn wonderful. The included widgets are fully customisable – you pick the layout, functions, icons/text, and colour of each button.

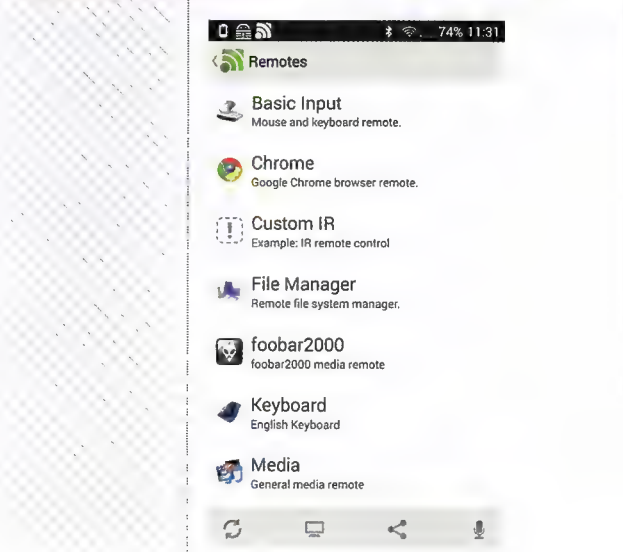
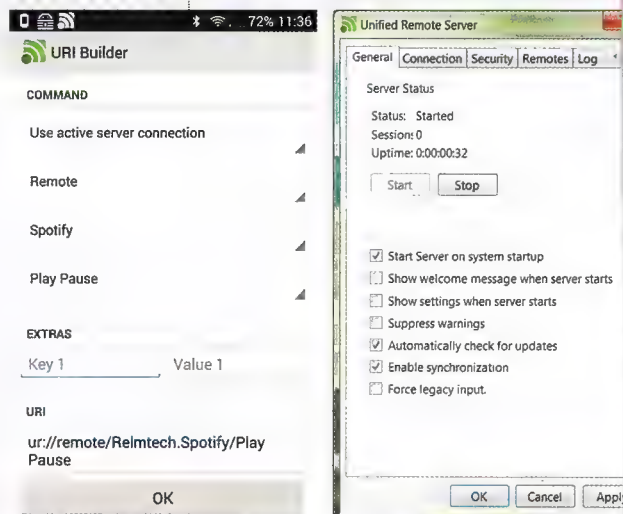
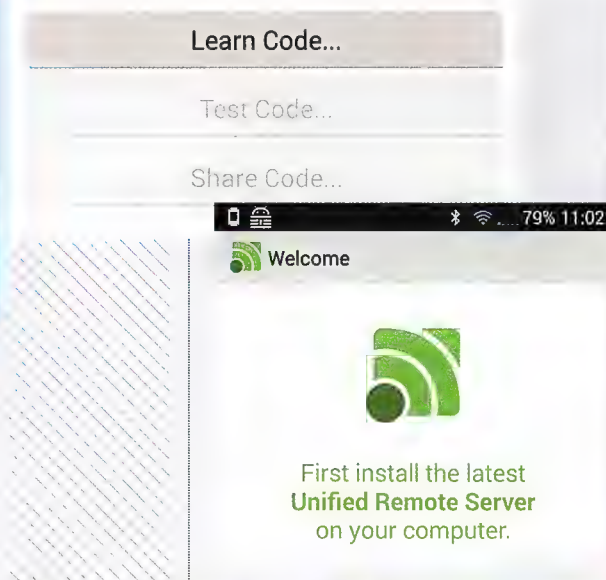
Now, what makes Unified Remote so brilliantly powerful is that it can be controlled over HTTP. This means that getting it to perform an action is as simple as sending it a URI – in fact, this is how it integrates with Tasker (rather than a Tasker plugin). Thankfully, the app comes with a URI Writer, so that you can just choose which actions you want to perform, and it will give you the URI required. You can then put this URI into a Tasker Task, display/save it as a QR code, or embed it into a NFC tag.

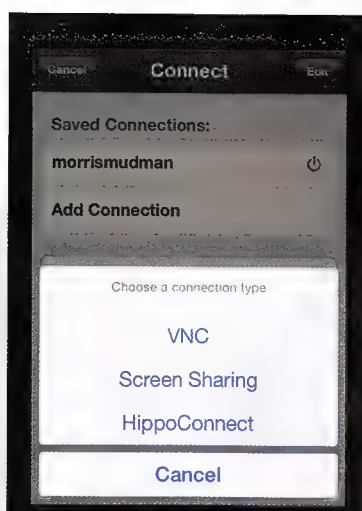
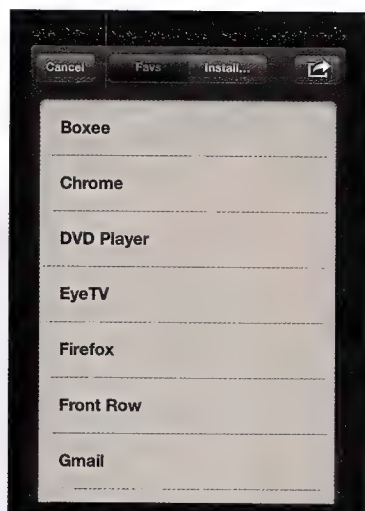
To learn more about some of the features I've mentioned here, head on over to www.unifiedremote.com/guides.



HTC

Press the learn button. Then hold the remote control approximately 5 cm from the IR reciver on your device and press the button that you wish to record.





SETTING UP HIPPOREMOTE FOR IOS

Set up iOS's most comprehensive remote app.

HippoRemote, like Unified Remote, is another all-in-one remote control app for your PC. The free version provides you with keyboard and mouse control, but it's the custom remotes in the paid (\$5.49) version that make it worthy of recommendation.

Again, like Unified Remote, you need to install a server-side program on your HTPC — in this case, it's a VNC app, as HippoRemote does its heavy lifting through VNC. If you already have a VNC app installed, it should work, but most people will have to download 'Hippo VNC' from the HippoRemote web site hipporemove.com/setup/windows. Once it's downloaded, open it, choose a place to install it, then open WinVNC.exe from within that folder. Choose a password, but leave the other settings as-is. Then open HippoRemote, choose 'Add Connection', selecting VNC as the connection type, and enter your PC's IP address and password.

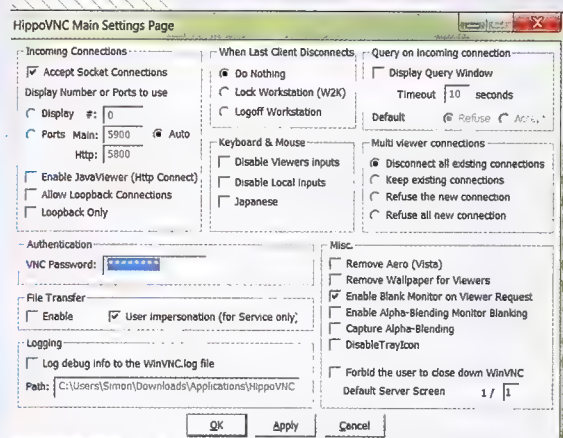
From the get-go, you now have simple keyboard and mouse control, using your iPhone's screen as a multi-touch touchpad.

However, the real magic starts when you start using Profiles. Profiles give you specific app control for the most popular apps around (you can see a list at hipporemove.com/profiles).

Profiles can be selected from within HippoRemote by pressing the big Profile button up the top of the screen, with recently used ones sitting in the 'Favs' section.

If you're not entirely satisfied with the functionality of a specific profile, you can have a go at creating your own using the built-in profile editor, or edit an existing one. For more information on how to do this, visit hipporemove.com/create.

In order for a remote to be effective, it has to stay on screen for immediate access — it's no good having to turn on the screen, type in your PIN, and open the app when you need to pause the movie when the pizza guy arrives. As such, HippoRemote will keep your screen on all the time. Recognising that this is a serious battery drain (and can be quite distracting during a movie), the devs have made it so that if you place your iPhone face down, it will turn off the screen, resuming again at pick up.



Speaking of interruptions, HippoRemote will even automatically pause your media when you receive a phone call, and resume it when it ends.

One feature I love is the gesture pad for XBMC, Boxee, and Plex (bottom left of their respective remotes). The gesture pad allows you to navigate the on-screen interface with the fluidity of a touch interface, including scrolling momentum, and quick gestures like tap-to-pause, two-finger-tap to stop, and swipe to skip. The screen on your iPhone even updates with Now Playing information/cover art, and the gestures still work right over the top of it.

As the final cherry on top of the icing on top of the cake, HippoRemote even comes with a login manager, accessible by a shake of the phone (along with some other handy options), that stores your usernames and passwords for your favourite web sites, allowing them to be entered into your HTPC's web browser in a quarter of a jiffy.

A worthy alternative, if you're into home automation, is TouchControl, from www.touchaptech.com.



STATE OF PLAY

CAN LOADING UP YOUR SYSTEM WITH RAM IMPROVE YOUR SSD'S PERFORMANCE, RELIABILITY AND LONGEVITY?

More RAM is a perpetually tempting prospect. It's one of the cheapest upgrades you can buy for your system, and (in spite of what the man in the PC store will tell you) the easiest to install. The benefits of going beyond 4GB of memory have thus far remained nebulous.

A system packed to the rafters with RAM isn't going to yield higher frame rates than a skinny 2GB machine, nor is it going to feel zippier when running a single application at a time.

Traditionally, the view has been that more memory is only useful if you switch between several demanding apps regularly, or insist on opening eight browser windows,

each streaming a different exciting episode of *Deep Space Nine* at 1080p because, you know, technology.

MORE RAM, SIR?

Now that SSDs are fairly commonplace in everything from weekend warrior laptops to water-cooled overclockers, there might be completely new benefits to running a RAM-heavy rig. Does having enough memory let you turn off the Windows Page File and save your SSD from unnecessary writes without risking system wobbliness? Performance degradation over time can be a real issue for solid state drives, so the potential benefit's considerable.

Then there's the idea of using the RAM your system isn't using at its

peak memory usage (which will be quite a lot in an 8GB system) and turning it into a virtual RAM drive to be used as a scratch disk. Low latency gaming modules will not only deliver some lightning reads and writes, they could also take the load off your SSD in instances such as image or video editing when your editing software's constantly caching your steady progress. But how tangible is that gain when you're working, and is it worth the risk of running out of available memory? Windows doesn't hang around to tell you what went wrong at that point – it's outta here. So say bye-bye to any unsaved progress.

Join us as we contend with the many pitfalls of page files and ruminate the reads and writes of



our beloved RAM drives, finding new and intricate ways to boost and reinvigorate your SSD, so you don't have to.

MEMORY GAMES

Performance degradation is a sad thing. When this tester first got his 256GB Samsung SSD 830 over a year ago, it had stop-and-stare IOPS. Out of the box its incompressible reads/writes were around 500MB/s to 400 MB/s, but after a year of heavy usage as a primary boot drive, you can go ahead and whack 100MB/s off each of those figures off. Ouch.

There's a metric tonne of information out there in the internet wilds regarding proper maintenance and performance tweaking for your solid state

storage, and one increasingly popular hypothesis is that you may be able to harness surplus RAM and send it to your SSD's aid. With 8GB of G.Skill Ares 1600MHz DDR3 memory sitting beneath our chassis and a 64-bit Windows install so

every GB of those modules could be put to use, we thought we'd test the theory.

Our first port of call is the page file. When you're running low on physical memory on account of those eight Deep Space Nine HD streams running in unison, Windows starts moving your most infrequently accessed memory pages on to the root directory of your hard drive, freeing up any physical memory space.

When that drive happens to be an SSD, that means Windows is performing a lot of writes, which degrades flash memory over time. Logic would seem to dictate that if you have enough memory in place, Windows doesn't need to reallocate resources away from it and you can



MLCs have a 10,000 write cycle life, but more RAM helps.

1 save your SSD the stress by disabling the page file.

To do so, head to the Control Panel, then select 'System > Advanced System Settings > Advanced' and hit the 'Settings' button in Performance. Find the Advanced tab on that window, and click Change in the Performance area. Now select your drive and choose 'No paging file.' You'll need to restart to put it in effect.

performance stakes.

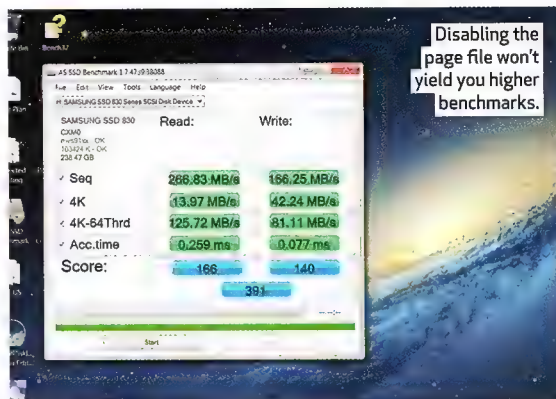
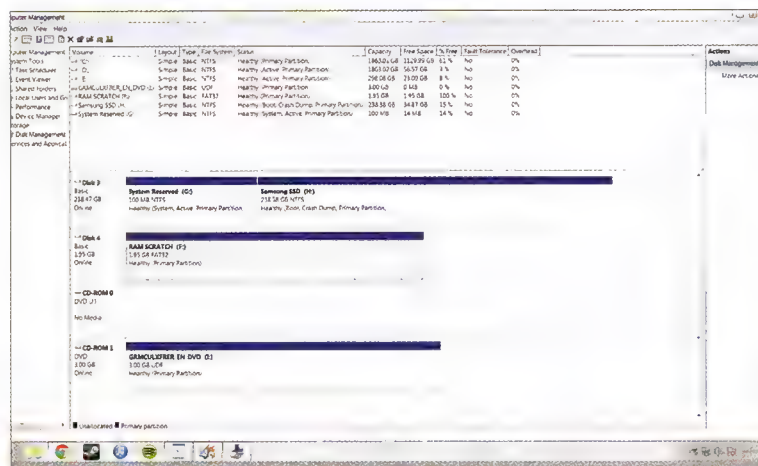
What we did find though was a marked improvement in system agility when running our own, home made benchmark. To simulate an everyday high-stress scenario, we ran (you guessed it) eight browser windows streaming HD video while at the same time simulating one week of *Football Manager 13*, switching back and forth between

"Doing away with paging isn't going to improve your synthetic benchmarks"

We're not talking about a performance tweak — doing away with paging isn't going to improve your synthetic benchmark scores. To prove it, we ran our beleaguered Samsung drive through AS SSD and ATTO benchmarks to find out its sequential read/write times for both incompressible and compressible data. Predictably, there was no real gain or loss of yardage in the

Chrome and the game each minute to force our system into accessing memory pages for both applications.

The results were encouraging: it took over a minute less to complete the *Football Manager* week (which involved demoralising home defeats to both Everton and QPR both times, since you ask) with the page file disabled. That's because our memory's read/write speeds are off



the scale compared to even an SSD, so by forcing the RAM to do the legwork we're also increasing performance.

You can smell the caveat coming, can't you? Here's the thing: this is the only scenario in which you'll see a benefit from disabling the page file. Sure, the modern age is playing hell with our attention spans and everything, but if you can't keep focused on one application for a minute without compulsively hitting Alt-Tab to reach the next, you're doomed never to enjoy anything ever again. The point is, a performance gain in this one specific event — switching from one app to another — doesn't justify turning off the page file.

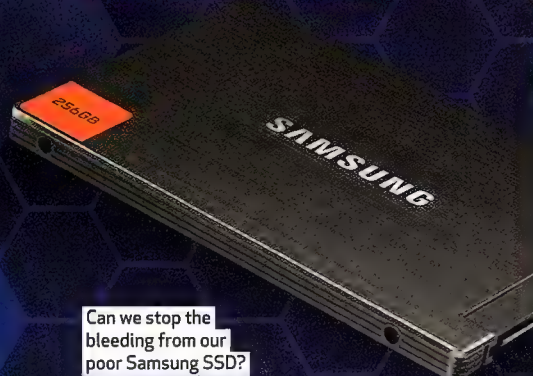
Why? Because there's a good chance you're making your OS a whole lot wobblier by doing so. In the event you actually do run out of physical memory with no page file to fall back on, Windows is checking out of there with nary a thought for your unsaved files. We experienced that first hand during our *Football Manager* stress test.

THE RAM REALITY

You see, by using so much RAM on open applications, it can't be put to use on file caching or handy tech like SuperFetch that keeps commonly used files close at hand by pre-loading

Creating a RAM scratch disk really helps minimise writes to your SSD.

Technical Analysis



We put a one-year-old 256GB Samsung SSD 830 through the AS SSD and ATTO benchmarks to determine its sequential read/write speeds, and stress-tested our system by running *Football*

Multi-application test

FM2013	TIME IN SECONDS FASTER IS BETTER	
ORIGINAL	5:17	
NO PAGE FILE	4:11	
2GB RAM DISK	4:39	

Manager 2013 and eight tabs running 1080p video in Chrome simultaneously. The idea isn't to look for performance gains, but to determine stability and look for anomalies as we alter system settings.

Sequential read performance (incompressible)

AS SSD	MEGABYTES PER-SECOND HIGHER IS BETTER	
ORIGINAL	316	
NO PAGE FILE	266	
2GB RAM DISK	296	

Jargon buster

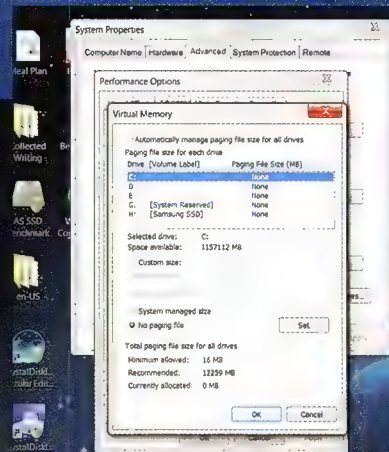
Page file: When your system runs out of physical memory to hold 'pages' of data, it caches them to a temporary folder in the root of your boot drive. This hidden cache is the page file, and it's filled with the data you accessed longest ago from the programs you still have running. By default, Windows allocates an amount of space equal to your RAM for paging.

Scratch drive: A disk drive used solely for caching, usually when running intensive programs like Photoshop, Logic or video editing suites like Premier Pro. The idea is to

dedicate an entire drive to work like the page file, freeing up space on your primary drive and taking the stress off system resources.

Sequential reads/writes: The number of read/write operations your solid state drive can perform, measured in megabytes per second. Maintaining the advertised speeds throughout the drive's lifespan is a dark art, and each cell has a lifespan of around 10,000 erase/write cycles (or so we're told).

You can certainly go without the page file; but we really wouldn't recommend that course of action.



them. In short – there is a performance gain involved in disabling the page file and forcing your physical memory to hold all page data, but it's wrapped in barbed wire.

Our Samsung SSD 830's none the nipper for dabbling with page file settings, and although in theory we might increase its lifespan by turning it off the side effects aren't encouraging. But there's one more avenue to explore: turning the GBs of RAM you're not using into a scratch device. The idea here is to create somewhere else for thrashing-heavy applications.

And what better place to do it than on a virtual disk in your RAM? We've already mentioned those impossibly quick IOPS compared to either solid state or mechanical storage.

First off you need to establish how much memory you can actually assign to a virtual disk. Do this by running a resource-hogging game and another program like iTunes, then check out the Performance tab

in Task Manager.

We used RAMDisk to create the drive. It allows partitions of up to 8GB for free, and it's simple. Use it to create a FAT32 drive, then add it as a volume in Disk Management (search for it in the Start menu). Once Windows finds it, you need to tell it where to cache temporary files. Do this in 'Control Panel' by clicking 'System > Advanced System Settings > Advanced', then hit the 'Environmental Variables' button and then select your new virtual scratch device.

After a few teething problems allocating just the right amount of RAM to maintain system stability, we're onto something. Our SSD's performance remains the same in synthetic benchmarks, but thanks to the scratch device it'll live longer: each multi-level cell (MLC) in a flash memory device cell is given 10,000 erase/write cycle lifespan before it fails. So, by diverting these to a RAM scratch disk we're increasing the SSDs longevity.



Benchmarking SSDs too often will wear them out prematurely.

So when it comes to the world of solid state drives, the more memory you have, the better. Our paging experiment shows it doesn't pay to turn it off, but the fact remains that the more system memory is available, the less your system needs to write to the page file. In systems above 8GB, you could easily partition 2-4GB off for use as a virtual scratch device, while also keeping enough memory available to minimise paging. ■

Sequential write performance (incompressible)

AS SSD	MEGABYTES PER SECOND HIGHER IS BETTER
ORIGINAL	182
NO PAGE FILE	166
2GB RAM DISK	164

0 50 100 150 200 250

Sequential read performance (compressible)

ATTO SSD	MEGABYTES PER SECOND HIGHER IS BETTER
ORIGINAL	315
NO PAGE FILE	298
2GB RAM DISK	289

0 100 200 300 400 500

Sequential write performance (compressible)

ATTO SSD	MEGABYTES PER SECOND HIGHER IS BETTER
ORIGINAL	182
NO PAGE FILE	172
2GB RAM DISK	172

0 50 100 150 200 250

howto

» QUICK TIPS

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

HARDWARE

SCOOBY-DOO: MOBO MOMENT

I've had some stability issues with my personal rig. I'll go to boot Windows 7, and after the loading screen I just get a black screen. When I go to reboot, it starts to power cycle as if there is an incorrect setting in the BIOS. Now, here's where it gets interesting. When I cycle the power by using the switch on the PSU, it will then boot into Windows on the first try! This entire process repeats itself every cold boot or restart. To me, this is screaming motherboard issues. I've already tested the RAM, and checked and double-checked all the BIOS settings. I'm really just curious about why cycling the PSU seems to fix things temporarily. What gives?

Christopher Maciag

Besides looking at your motherboard, you may also want to examine your PSU. It could be an issue with the unit's Power Good signal. This is the signal the PSU gives the motherboard that it's OK to start to boot. If the signal is incorrect or absent, it could very well cause the system to reboot.

You didn't give your motherboard's vintage, but if it's old enough to have bad

capacitors, that could also be the issue. Get out a good flashlight and look at the capacitors, particularly those around the CPU. If they're bad, they may resemble a full Coke can left in your car on a very hot day.

MAC

I HAVE PASSWORD-PROTECTED TRASH!

Every time I move something to Trash, the computer's started asking me to enter my password. I can empty it OK; it's when I move stuff that I have the problem. It's nothing to do with permissions and it seems to affect everything: .jpgs, old documents, whatever. I've even gone to the trouble of creating short documents in TextEdit just to see, but it always asks for my password before I can move them to the trash. Help!

L.B. Hill

It is to do with permissions, but it's not something Repair Permissions in Disk Utility can fix. It's the Trash folder ownership permissions that have become corrupted. To fix it, open Terminal and type `//sudo chown youraccountuser name.Trash.`

Luis Villazon

A faulty power supply or bad capacitors can be the cause of system instability.



Finder wants to make changes. Type your password to allow this.

Name: MacFormat

Password:

Cancel

OK

A password prompt when you delete a file suggests you don't own the file, or the Trash folder.

HARDWARE

X16 OR DUAL X8?

The APC October article "Put it to the test" (see page 58) answered whether a x16 PCIe slot ran faster than x8, but didn't really clarify what happens if you run SLI in two x16 slots. Do they function as two x16 or is there degradation so they run at less than that? I'm thinking about a Z87 ASUS Maximus VI Hero board for my next build. It says "x16 or dual x8" in its documentation. What does that mean for my big expenditure of two expensive video cards? Does the SLI bridge solve any performance problems between the slots?

Chris Ajemian

Many motherboards (well, actually the CPUs), including the Maximus VI Hero, don't have enough PCIe lanes to run more than one video card at x16, so if you use two cards in SLI/CrossFireX, each PCIe slot drops down to x8. The good news is that those slots are PCIe 3.0, which means that in x8 mode they each have the same bandwidth as a PCIe 2.0 x16 slot. You won't see any slowdown in your expensive cards. Even if your cards only have PCIe 2.0 connectors, the slowdown will be on the order of 1 or 3 percent. And the SLI bridge does solve performance problems between the slots, in that SLI won't work without it. APC staff

HARDWARE

SHOULD I UPGRADE?

I've been sporting an ASUS Maximus IV Extreme for a couple of years now, originally with a Sandy Bridge, upgraded to Core i7-3770K. I went all out with an EVGA GeForce

You need an SLI bridge to get Nvidia multi-card graphics setups working.



GTX 590 because a) it was the most awesome at the time, and b) it supported three DVI connections on one card for my three LCDs (using 3D Vision on the Acer GD235HZ).

I feel compelled to upgrade to a Haswell Core i7-4770K and ASUS Z87-Deluxe. I can't decide the best way to utilise my three screens. Should I keep the GTX 590 as-is, or should I change out to a newer Nvidia 700 series card? Performance isn't currently a problem, but I'm always looking for something better. The GTX 590 is convenient because it's two GPUs with SLI on one card and connects all my screens. I'm having trouble finding a contemporary 700 card that can connect the three screens without going with two cards. Any advice?

L. Chariot

Well, you could save a few hours of build time and just light a few thousand dollars on fire. We aren't sure the roughly 20 per cent performance boost you get from that CPU/mobo upgrade is worth the \$800 you're going to spend, especially if you have no complaints with your current situation. But then, the same could be said of your desire to upgrade from the GTX 590. The only single-card upgrade that's actually an upgrade from where you're standing is the GTX 690. You'll get your three DVI ports and a substantial performance boost while remaining on a single card, but you'll spend \$1,200 on the GTX 690. If it were us, as long as we're spending money, we'd get two GTX 780s (or Titans and run them in SLI. Either config will get you more juice than a GTX 690, and the dual 780s will only cost you around \$1,500. Or you could wait for the rumoured GTX 790, which is probably your best bet. In the meantime, if you haven't already, invest in a nice big SSD for your OS and games. You can get a 1TB Samsung 840 Evo for less than \$750.

APC staff

IOS

IS IT OKAY TO ALWAYS RUN FLAT?

I am forever accidentally letting my iPhone run flat. Sometimes it can be a day or more before I can charge it again. Is this bad for the phone, and, how does the clock manage to keep time when the battery is flat?

Jez Millington

As the battery runs flat, the voltage drops. At a certain point it will be too low to power the CPU and screen, so it shuts down. But the clock uses a separate part of the SoC and runs at much lower voltages. Running the battery entirely flat could take weeks or months, but the longer you leave it the more it degrades the charge capacity.

Matthew Bolton



If you already have a third-gen Intel Core chip, there's little performance to be gained by upgrading to a fourth-gen model.

41111111

Intel® Core™ i7

HARDWARE

WHERE ARE THE 7,200RPM DRIVES?

In the computer world, it seems like things generally keep getting faster and better. But I've noticed something amiss as I shopped around for a laptop for my daughter. For years, 7,200rpm hard drives seemed to be the preferred choice, right? I know there were 5,400rpm drives around, and even the 10,000rpm higher-end drives, but most folks wanted 7,200rpm, paired with an SSD as the boot drive or caching drive. For some reason, everywhere I look, 5,400rpm drives seem to be the current standard in laptops. There are frequently other choices such as hybrid drives, and an occasional 7,200rpm drive, but the default is almost always a 5,400rpm HDD. Why have we taken a step backward here? With boutique vendors you have a lot more choices and can get 7,200rpm or hybrid drives in addition to your SSD. But my daughter is interested in an HP laptop, and they don't offer anything but a 5,400rpm drive or a 5,400rpm hybrid. Same for Dell and Lenovo. Why the resurgence of 5,400rpm drives all of a sudden? They are sooooo slow.

K. Browning

As you mentioned, SSDs have completely taken the speed crown from 7,200rpm laptop drives, and hybrid drives such as the Seagate Barracuda XT make a good middle ground between SSDs and HDDs by caching the most frequently accessed sectors to NAND. Seagate certainly thinks hybrid drives are the way forward, and is discontinuing 7,200rpm laptop drives entirely after this year. The company also finally has a decent consumer SSD.

WD and HGST are still making 7,200rpms, but as to why OEMs aren't putting them in laptops, we're guessing it's a combination of cost savings and power savings. Or it's just the price point you're looking at. A quick glance at Dell and Lenovo's web sites

reveals plenty of 7,200rpm drives in Inspirons and ThinkPads, and even HP offers 7,200rpm drives as upgrades on plenty of its mainstream laptops.

APC staff

HARDWARE

FANS TO MAX!

I have an HP Pavilion running Windows 7 64-bit. It's a few years old now and I have never had any trouble with it until now. Recently, on boot the CPU and case fan go to full speed. They used to idle and only spin up under load. There are no sudden temperature issues; the CPU heat sink is cool (35-40°C), as is the interior of the case.

If I put the computer into sleep, on restarting the CPU fan runs at idle, but does not respond to load as it used to. The case fan still runs full speed. I have blown out the interior of the case and taken out and re-seated the connectors.

There do not seem to be any fan control options in the BIOS and the fans are set to auto in the power plan. The only recent software change I have done was to re-install the Realtek audio driver because I was having some trouble with sound on one channel.

The computer now sounds like a Harrier taking off and it's annoying me. As a bodge I have put a dropping resistor into the case fan power line to slow it down a bit, but this is not a good answer and as I have said, the CPU fan does not spin up under load as it should.

Neil Malton



In many high-end laptops, 7,200rpm hard drives have been replaced by SSDs.

Out-of-control PC fans can be managed manually through the addition of a fan controller.



It's not a great answer, no, but mad props for such an ingenious kludge. The fan is supposed to come on at full speed when the motherboard first powers up. This is a failsafe feature to make sure the CPU is adequately cooled, even if the POST fails for some reason. So the question is not 'Why does the fan come on at full speed?', but rather 'Why doesn't it slow down again almost immediately?'

There's a small chance that resetting the CMOS settings to the factory defaults might be all you need to do, but I'm not terribly optimistic, so you better take photos of all the BIOS setup screens before you reset, so you can roll back again.

No, this is probably caused by a minor motherboard fault. Replacing the motherboard on a machine of your vintage would simply be throwing good money after bad. Instead, let's try a souped-up version of your inline resistor; to wit, a fan controller. You can get really cheap ones, but I'd favour something like the Akasa FC Trio, which is about \$50 (plus shipping) on eBay. This looks like the car stereo out of a

'90s VW Golf, but it has pretty blue LEDs so you can convince yourself it's actually sort of an upgrade, and it will give you a lot more control than just a single fixed resistor.

Luis Villazon

MAC APPS

CATALOGUING A COLLECTION

I recently had a problem where Pages was hanging frequently. I have now discovered I was using Pages for a purpose for which it was never intended: frequent additions, deletions and general modifications to a document I created two years ago. The document lists items in my antiques collection, which runs to nine pages, contains 200 items and changes as I buy and sell. I have now transferred it to TextEdit and all is well. I've also had iTextExpress and Bean recommended for the purpose, but do you have other suggestions?

David Hall

You're quite right; Pages is a word processor that focuses on pretty page layouts with images and flowing text. The application that was intended for your particular

purpose is a database. 20 years ago, databases were a mainstream application for the end-user, just like a word processor or a spreadsheet. On the Mac we had FileMaker and everyone kept their vinyl collection indexed with it. You can still buy FileMaker (but it's called FileMaker Pro 12 now and costs \$299 because the target market is small businesses). There is a good database included with OpenOffice, which is free. But if all you want to do is maintain a virtual stack of index cards, a database is the most complicated way to do it. TextEdit is probably too far the other way. If you're going to use a word processor, you'll want something that makes it easy to separate the entries for each item. However, might I suggest you try using a spreadsheet? This lets you enter freeform text and images, like a word processor, but it has rows and columns that you can customise to display the information clearly. It will also format dates and prices for you, and perform calculations on the numbers. There's a free one included in OpenOffice, as well.

Luis Villazon

HARDWARE

PRECIOUS MEMORIES LOST!

My Western Digital My Book 1TB external hard disk, which was working normally until two days ago, has suddenly become unreadable. Attempting to use the in-built error-checking tool in Windows XP Professional has been unsuccessful, as has been running Norton Disk Doctor (this can't access the drive at all). I fired up PartitionMagic 8.0 and used its in-built error-checking too, which produced the message: 'ERROR #1513 Bad attribute position in file record'.

Component lists (read-only) - OpenOffice Calc											
B69											
	A	B	C	D	E	F	G	H	I	J	K
1		Status	Price	Size	Colour	Number req	have so far	Supplier	Code	Total	used for
2	Square button	O	0.41	14x14mm	red	6	1	bitsbox.co.uk	SW096		E2.46 Action groups
3	Square button	O	0.48	14x14mm	white	10	1	bitsbox.co.uk			E4.80 throttle presets, brake
4	illuminated button	A		18x18mm	red	1	1				E0.00 Abort button
5	illuminated button		2.79	18x18mm	green	1	1	Maplin	N08AR		E2.79 Stage button
6	Missile switch cover	O	1.78	50x14	carbon fibre	1	1	proto-plc.co.uk	PPCOM-11059		E1.78 Arm switch cover
7	Toggle switch	O	0.69	14x18x25	silver	9	1	bitsbox.co.uk	SW019		E6.21 gear, lights, rcs, sas, brakes, abor
8	LED clip	O	0.06	3mm	-	20	20	bitsbox.co.uk	HW019		E1.20
9	LED			7mm	red	1	1				E0.00 Brakes
10	LED		0.99	7mm	yellow	10	1	Maplin	N65AX		E9.90 Lights/RCS/SAS, flight selector
11	LED		1.54	7mm	green	4	2	Maplin	N66AX		E8.16 gear switch
12	3-pos selector dial	O	1.49	-	-	1	1	bitsbox.co.uk	SW027		E1.49 flight mode selector
13	6-pos selector dial	O	1.49	-	-	1	1	bitsbox.co.uk	SW078		E1.49 altitude mode selector
14	selector knob	O	0.6	33.4mm	black	2	2	bitsbox.co.uk	KN014		E1.20 for rotary dials
15	illuminated button		2.79	18x18mm	blue	4	2	Maplin	N09AR		E11.16 attitude control presets
16	LCD screen					1	1				E0.00 general purpose display
17	4-way digital joystick		14.99	36x36mm		2	2	RS components	479-1570		E29.98 translation/rotation controls
18	2 or 3 digit LED display					1	1				E0.00 Throttle reading
19	On-off-on toggle switch					1	1				E0.00 alternative throttle control
20	heat shrink tubing										E0.00
21	I/O expander		7.69	28x28mm	-	4	4	proto-plc.co.uk			E30.76 saving IO pins on the Arduino
22									Total		E111.38
23											
24											
25											
26	Item		I/O req								
27	action groups		10		Board 1						
28	abort switch		3								
29	stage		3								
30	gear		2		Board 2						
31	rcs		2								
32	sas		2								
33	lights		2								
34	brakes		3								
35	on/off/test		2	Or 1 analogue							
36	joysticks		8		Board 3						
37	flight mode selector		4	Or 1 analogue							
38	throttle rocker		2	Or 1 analogue							
39	throttle presets		5								
40	Total		48	Err:509							
41											
42	plus										
43	throttle LEDs										
44	LCD1										
45											
46	Running total										
47	18x chrome led holders		5.76								
48	red wire + white wire		5.38								
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When a word processor is too simplistic and a database is too complicated, try a spreadsheet.

I have never met this error before; what does it mean and what is its cause? Reformatting the drive would have to be an absolute last resort as it contains many important backup files from various computers.
Alan BW Flowerday

Argh! Alan, you're killing me here! I feel like the parent of the child that has just fallen over backwards onto the hard tile floor of the food court in a busy shopping mall. I told you not to tip your chair back! I told you this would happen! I'm a good parent! I try to protect you, but you never listen to me!

Reformatting your backup disk shouldn't ever feel like a last resort. The moment it does, it's not a backup disk any more. It's a disk that needs to be backed up itself. Backups are copies of data that you already have somewhere else. If you back up a computer and then you get rid of that computer, your backup has become an archive, and archives need to be backed up. Or the important ones do, at least.

OK. Calm down. Cleansing breath. I'm not angry with you. I'm just upset. Error 1513 doesn't necessarily mean anything bad. Partition Magic is super old now, and it can get tripped up by NTFS volumes, particularly dynamic disks. There used to be a patch to upgrade to 8.02 that purported to fix some of these problems. But that was back in 2004 and I don't think it's available anymore. Anyway, that's not the problem. The problem is that your disk is unreadable in Windows. Best case scenario — best case — is that reformatting will let you reuse the physical drive. Personally I wouldn't trust it. Backup disks only get one chance. If they blow that, they go in the bin.

Luis Villazon

HARDWARE

ALONE IN THE DARK

It has been a week now since my PC stopped displaying. I was watching a movie and all of a sudden it shut down. When I try to turn it on, it just runs the coolers but doesn't display anything on the screen. What could be the problem?

Louis Motaung



Does it literally just spin the fans when you start up? Not even the whirr from the hard disk or a beep when the POST completes? That's a blown motherboard or (less likely) a fried CPU. If there's no beep but you can feel the hard disk humming as it spins up, this could still be a motherboard fault, but it might also be that the 12-volt rail from the power supply is dead. Try replacing the PSU first, since that's usually easier and cheaper. If you hear the POST beep but there's nothing on the screen, it could be 'just' the graphics card. Connect your monitor to the onboard graphics adapter for your motherboard, if you have one.

The common thread in all of these possible diagnoses is that something broke and you will need to buy a new one.

It was probably caused by overheating.
Luis Villazon

MAC

VISUAL BASIC ON A MAC

I need to use Visual Basic Express for my university degree, and, as far as I know,

Microsoft don't do a version for Macs! What's the best choice: Boot Camp, Parallels or buying a Windows computer? I would prefer a cheap-but-reliable option!

Thomas Pickup

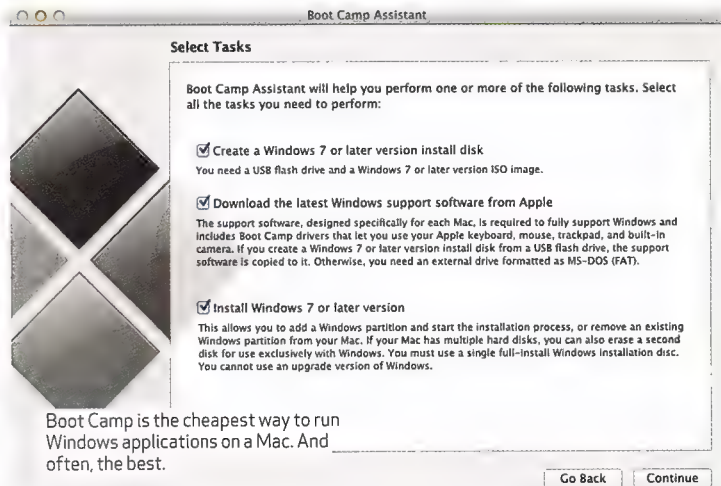
Unless your Mac doesn't have enough space to devote 35GB to a Windows partition, Boot Camp will be the cheapest. You'll need a copy of Windows, which is about \$299 for Windows 7. The only advantage in using Parallels or VMware Fusion is you can run Mac and Windows apps at the same time. That's probably not something you'll need to do; programming is a single-tasking activity and being isolated from distractions such as email and IM are an advantage. Plus you'd need to buy Parallels for \$89.

If you don't have the disk space to devote a partition to Windows and Visual Studio, then it's a trickier decision because Boot Camp won't let you install Windows on an external drive.

I don't suppose you have a Mac Pro do you? Possibly not, but even if you have an iMac or a Mac mini, you can still upgrade the internal hard disk if you're feeling at all adventurous. If you don't want to do that, it would be cheaper to get an external drive and move enough of your data to make room for a Boot Camp partition on the internal drive. But at this point I'd say it's better to cut your losses and get a cheap Windows laptop. That's about twice the price of buying Windows separately and an external disk, but more convenient. Try one of the entry-level models in the Acer Aspire range.

A final thought: your university degree has probably explicitly mandated Visual Studio Express so you can install the example projects supplied by your tutor. But it's possible they're recommending it because it's free. If so, you might want to take a look at KBasic (kbasic.com). This uses a version of BASIC similar to VB.NET and 100% code compatible with VB6 and VBA. The IDE looks similar to Visual Basic's as well.

Luis Villazon



Boot Camp is the cheapest way to run Windows applications on a Mac. And often, the best.

Go Back Continue

Smarter Windows notifications

Get on top of your emails and updates with Growl for Windows, says Dan Grabham

YOU'LL NEED THIS

Growl for Windows

You can pick up a copy of Growl for Windows from www.growlforwindows.com

Smartphone users are used to notifications — messages that tell you when certain things happen, such as when someone sends you an email, replies to you on Facebook or mentions you in a tweet. Wouldn't it be great if your PC did the same?

Originally designed for Apple's OS X, Growl is a notification tool that lets you know when things happen on your PC. It's very useful — you'll find out in an instant

when an email arrives, or when a file has finished downloading.

As well as downloading and installing the Growl application from www.growlforwindows.com, you'll also need to download apps to work with Growl from www.growlforwindows.com/gfw/apps.aspx.

These are the plug-ins that link Growl to popular applications such as iTunes, Facebook or Gmail, and enable them to send you important notifications through Growl.

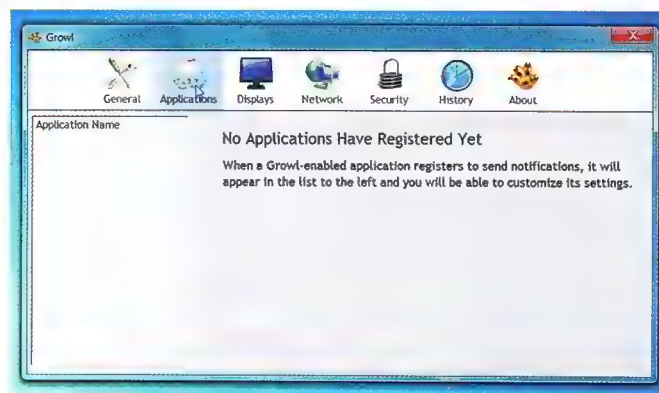
Step-by-step: Set up Growl for Windows

Track every download, email or update with a series of helpful notifications



1 ADJUST YOUR SETTINGS

Once you've installed Growl, right-click its icon in the notification area and select Settings. You'll then be presented with the window pictured above, which lets you decide how Growl should work on your PC. All the options here are explained on the opposite page, but essentially it lets you choose when Growl runs, and what it should do when it detects that you're away from your home machine.



2 THE APPLICATIONS TAB

Now click the Applications icon at the top of the window and you'll see this screen. It's blank now, but this is where the Growl apps will appear when you've installed them (these are the plug-ins we mentioned in the introduction). These enable Growl to interact with other applications on your system. We'll show you how some of these work very shortly.

NAVIGATE

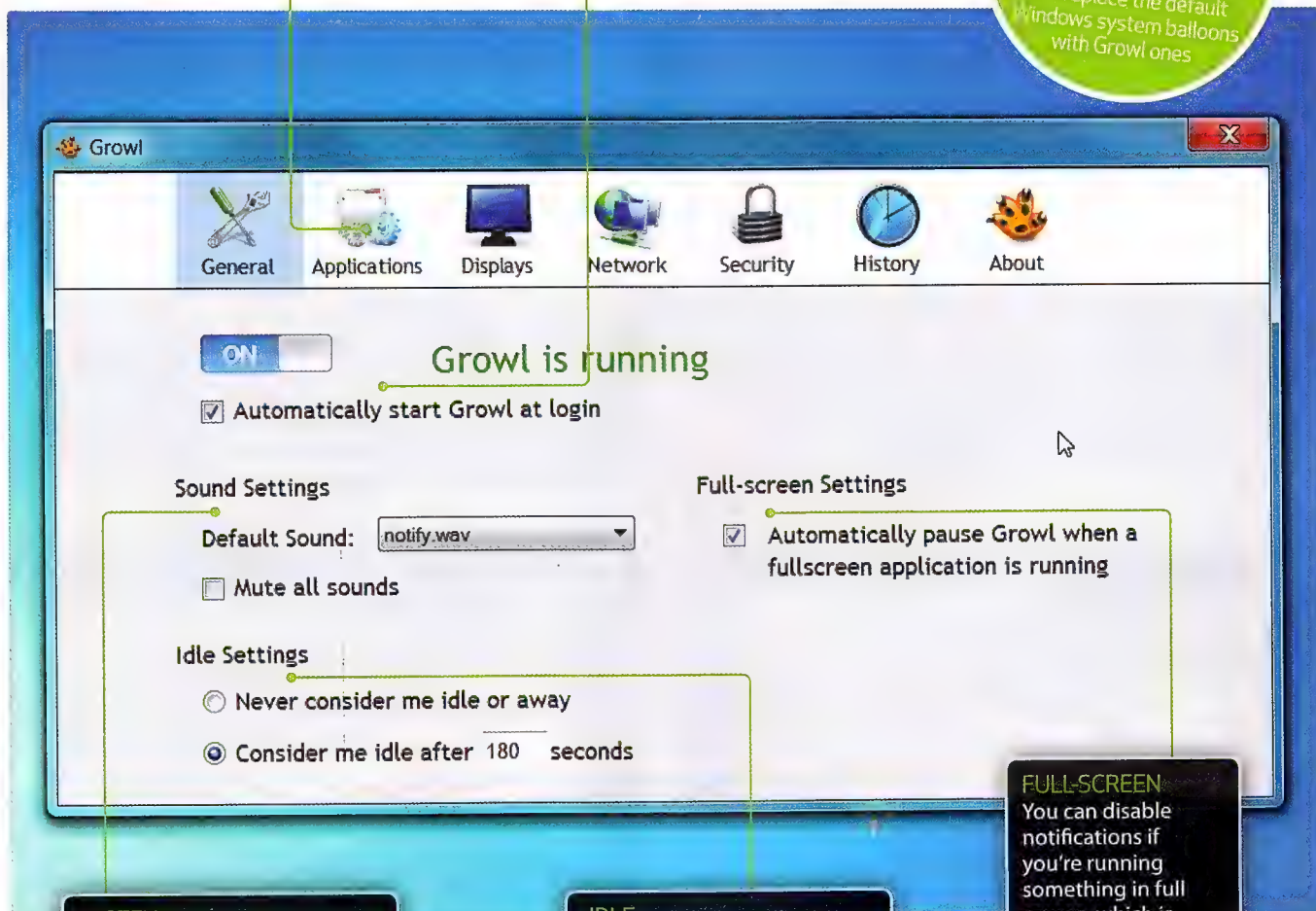
This is Growl's Settings window. Find your way around its various options using the icons at the top of the screen.

AUTO-START

As well as turning Growl on and off, you can also decide whether it should run as soon as your system starts up.

TOP TIPS

REPLACE NOTIFICATIONS
If you install the Windows Balloons Growl plug-in, you can replace the default Windows system balloons with Growl ones



LISTEN

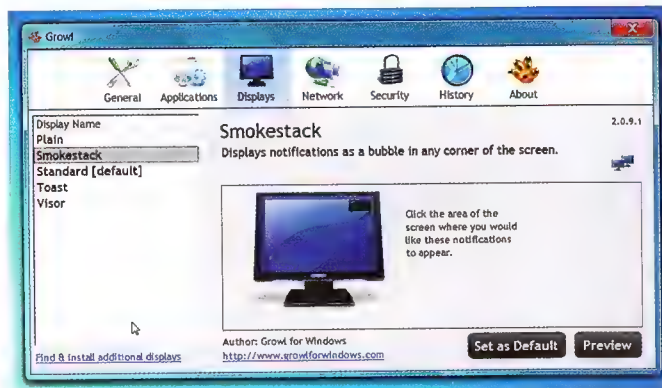
You can choose the default sound that Growl's notifications will chime with when they pop up. You can also mute them all if you want.

IDLE

If you don't use your PC for a while, you can tell Growl to consider you 'away'. Growl will save missed notifications until you return.

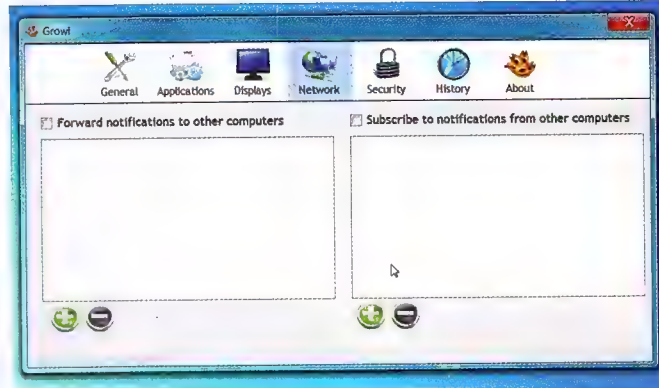
FULL-SCREEN

You can disable notifications if you're running something in full screen, which is very useful if you're streaming videos or enjoying a game.



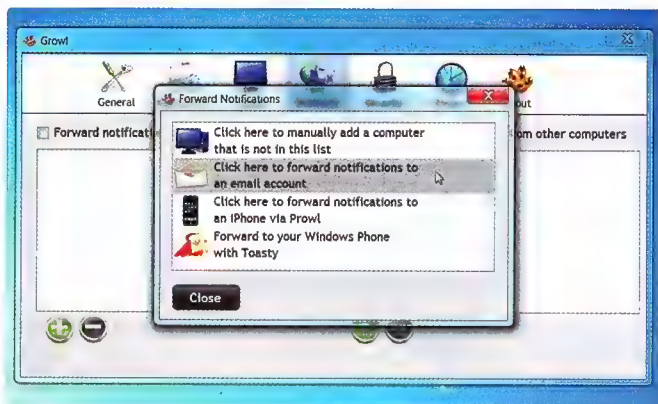
3 CHOOSE YOUR DESIGN

Growl's notifications can appear in a variety of ways, and you can choose from an assortment of different designs. The Displays tab enables you to define how your notifications should look when they appear. We prefer the Smokestack design, which displays notifications in smart, dark grey boxes. You can also, rather handily, choose where on your display you want your alerts to appear.



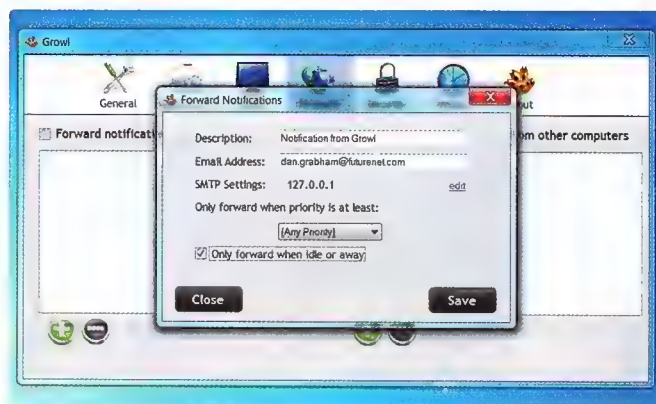
4 PASS IT ON

Growl can pass notifications to other computers if you're not at your desk. Say you're waiting for something big to download and you want to receive a notification on your phone when you're away from your PC. No problem — just ask Growl to send a note direct to an email address of choice. Check 'Forward notifications to other computers' to set this useful extra feature up.



5 SEND AN EMAIL

Click the green '+' icon at the bottom of the window, and this menu will appear. Here we've chosen to forward notifications to an email account, but you can also forward them to an iPhone via the Prowl app, NMA on Android, or via the Toasty app if you have a Windows smartphone. With this useful feature, you can see notifications on your phone instead of your PC. It's clever stuff.



6 FILL IN YOUR DETAILS

Now enter your email address. The final check box here is crucial, because it tells Growl whether you always want notifications forwarded to your email, or only if your PC is idle. We recommend choosing the latter option to stop your inbox being flooded. You can also decide to only forward notifications above a certain priority level (all notifications can be given priorities).



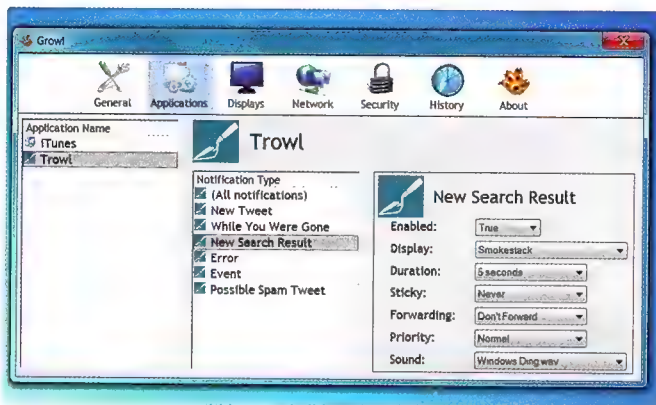
7 USE iTUNES WITH GROWL

You can make Growl even better by using it with other apps. Here I've downloaded the iTunes plug-in. Once you've installed a plug-in, it appears in the Applications tab. This particular plug-in tells you when the track changes while you're listening to music in iTunes. As you can see, you can alter settings for this notification, including the priority we mentioned in step 6.



8 SEE NOTIFICATIONS

You've probably noticed that I've given this alert the Emergency priority, although it's probably a very low priority in truth. Your notifications will appear in your preferred location as the track changes (ours pop up in the top-right corner of the screen), and will use the notification design you chose previously (we've picked the dark grey Smokescreen option).



9 TRY MORE APPS

Other installed apps also appear in the Applications tab. This is Trowl, an app that can notify you of messages you receive on Twitter. Note in the settings shown here that we've also asked this Notification not to be forwarded to another device or email account. There are also more actions you can ask to be notified of in this app, such as when you get sent a spam tweet.



10 START EXPERIMENTING

Now that you understand the basics of Growl, the best thing to do is download some of the add-in apps, explore their features and experiment to find the notification settings that are best for you. If you're anything like us, you'll probably configure too many notifications at first, but before too long you'll be wondering how you managed without this funky little program. ■



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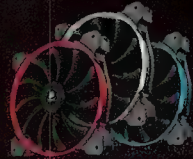
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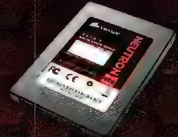
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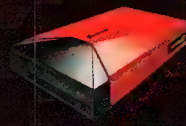
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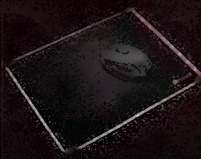
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Sharing between Linux and Windows

FAT, NTFS, Fuse and exFAT, Neil Bothwick unravels the pros and cons of each for exchanging information with Windows.

As much as we may love desktop Linux, you have to accept that there are a lot more Windows end users out there and you occasionally need to exchange information with them. While file sharing services such as Dropbox, ownCloud and even good old email make electronic sharing of files easy, sometimes there's no substitute for the good old sneakernet.

Whether it's a quick exchange of a couple of photos on a USB stick or hundreds of gigabytes on an external hard drive, we need a medium that is both readable and writable by users of all platforms. This month we're looking at various options for formatting with different filesystems.

FAT BUT SMALL

The de facto standard for interchangeable filesystems has long been the Windows FAT filesystem. It has served us well when transferring files via USB stick, and is still how most flash drives are formatted when you buy them, but it has its limitations. FAT is a 32-bit filesystem, so it has a maximum file size of 4GB; which is another of those "640k should be enough for anyone" moments, where such a limit probably

seemed more than sufficient at the time it was created. This is a core limitation; you can kludge around it by compressing or splitting files but no file can ever exceed 4GB in size.

The other problem that affects using FAT on Linux is that of permissions. FAT has no support for Linux file ownership and permissions, so a sort of pseudo metadata is applied to the filesystem when it's mounted. This defaults to everything being owned by the user who mounted it and only writable by that user. This is fine when you use a desktop automounter to do that job, as it mounts so it belongs to the user running the desktop. If you mount from /etc/fstab or a terminal — either as root or using `sudo` — only root can write to the device. One solution is to use `pmount`, which mounts removable media as a user, preserving the ownership.

Another solution, which also works when you want more than one user to be able to access the device, is to change the `umask` setting when mounting. The following code will mount the device with full `rw` permissions for everything.

```
mount /dev/sdb1 /mnt/usbstick
-o umask+000
```

A more secure option is:

```
mount /dev/sdb1 /mnt/usbstick
-o dmask+000,fmask+111
```

This sets directories to `rw` but files to `rw` (the letter `x` here denotes that the file or directory is executable). You can also set ownership of the filesystem here with the `uid` and `gid` options. These options can all be given on the command line, as here, or in /etc/fstab.

NTFS

Microsoft's NTFS (New Technology Filesystem) is designed to be a replacement for FAT, which has been used on hard disks for many years now. Support for NTFS in the Linux kernel has never been that great, though. Even in the latest kernel currently available (3.10.9) NTFS is only safe for read-only operation except in limited circumstances.

Files in NTFS can only be written to safely if the file already exists and the new file is the same length as the old one. In other words, you can change the contents of the box but not its size. This is a severe limitation, and even that ability is possible only when it is specifically enabled in the kernel; something that many distributions do not do.

However, there is a Fuse (see 'Fuse: a World of Filesystems', right) filesystem that gives full read/write support for NTFS, called NTFS-3G. This should be included with most distros and works just like any other filesystem as long as the fuse kernel module is loaded. This is the default NTFS driver for most distros now, you should be able to plug in an NTFS formatted device and either let the desktop mount it for you or mount it from the command line like any other filesystem.

While NTFS file permissions are still incompatible with the Linux metadata, NTFS-3G defaults to a `umask` of 0, so everyone gets full read, write and execute permissions. If you want to prevent files having the executable bit set, you can use the `dmask` and `fmask` options as for FAT. You need to set the executable bit for directories or you won't be able to read their contents.

FAT GOT FATTER

NTFS is intended for use on hard disks; it was originally developed for use with

MTP: network sharing

If you have tried to connect a recent Android phone, or some MP3 players, to your computer via USB, you may have found that it's not possible to mount them as storage devices, like we used to in the good old days.

There is a very good reason for this, particularly with a phone. You cannot have the same filesystem mounted by two systems at once, as each has no way of knowing what the other is doing. This is why Android previously insisted on unmounting your SD card in the phone before allowing you to mount it over USB, which could cause problems for any applications using it.

The solution is to use MTP (Media Transfer Protocol) which is a form of network sharing. The filesystem remains under the control of the device but you can read it on your computer, much like using an NFS or Samba share.

Once again, we turn to Fuse for the Linux solution, and there are at least three alternatives: MTPFS, Simple-mtpfs and JMTPFS. I prefer JMTPFS (See Jason's Ferrara's blog post on his Fuse based MTP filesystem here: tinyurl.com/7pezjlp).

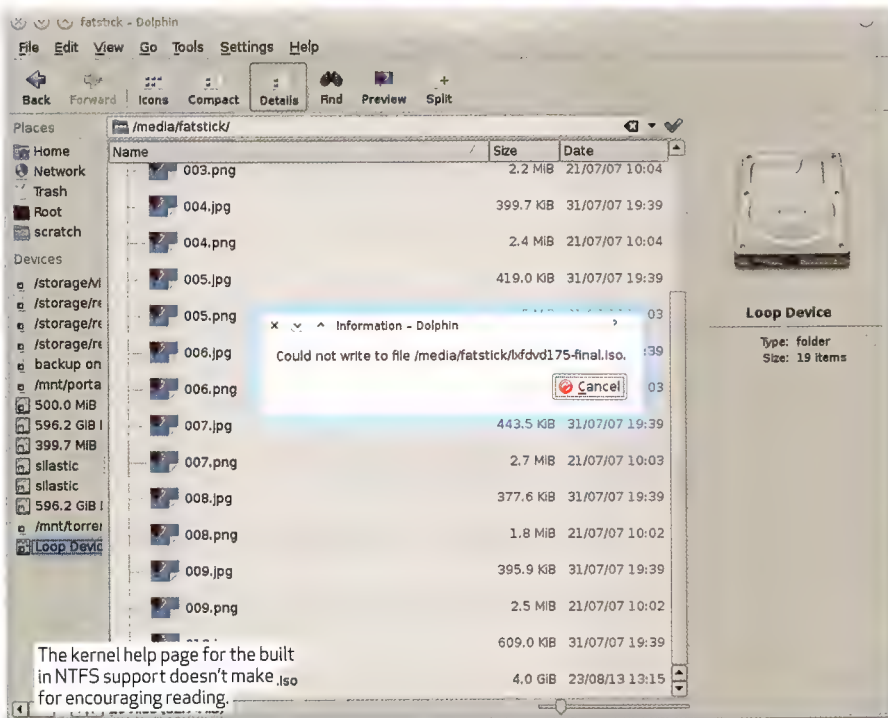
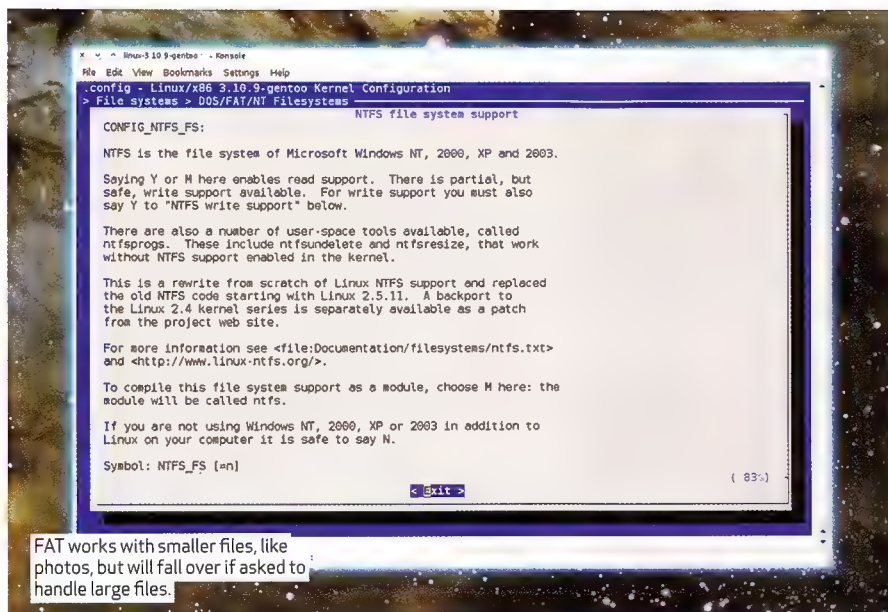
Using it is as simple as plugging in your phone and running:

```
jmtpts /mount/point
```

It will find your phone and mount it under the given path. If the phone has more than one storage area, for example, built in and a removable card, they will appear as separate directories under the mount point.

While the filesystems we looked at elsewhere could be unmounted in the standard way, this one, as with other Fuse filesystems, is unmounted with:

```
fusermount -u /mount/point
```

Windows NT. Most of its features are aimed at that type of usage rather than for smaller removable storage. FAT was fine for that until things got too big for it. For instance, when cameras just took photos and stored them on a memory card smaller than 4GB, the size limit was not an issue. Now that cameras also record video (and 64GB SD cards are now available for less than I once paid for a 16MB CF card) that limit is no longer acceptable.

Microsoft's response was exFAT, a filesystem designed for flash drives without the limits of FAT, or the overhead of NTFS. This is the default filesystem for SDXC cards. The exFAT filesystem has a good collection of patents and licensing conditions, enough to make including it in the kernel a problem, so the free option uses Fuse.

The licensing situation also makes including even the Fuse version in a distro a grey area. This means that the exFAT package is rarely installed by default, but is generally available in the package manager's default repositories.

There are usually two packages to install, `exfat-fuse` and `exfat-utils`. The former package is the filesystem driver and the mount handler, and is all you need to mount existing exFAT filesystems. The other package contains various utilities, and you will need this to create, repair, relabel or examine exFAT filesystems. Once the package is installed, you can mount and work with exFAT formatted devices the same as any other filesystem.

Fuse: a world of filesystems

Linux implements filesystems within the kernel, in the same way as most other hardware drivers. This can be in the kernel tree, which is usually the case, or as a third party module as with ZFS. But what happens if you have a filesystem that can't or won't be linked into the kernel?

Fuse (Filesystem in Userspace) provides a solution, a way to create filesystem drivers without needing to link them into the kernel. All the kernel magic happens in the Fuse module while the driver talks to it from userspace.

As far as the kernel is concerned, the filesystem of any device mounted via Fuse is Fuseblk. No matter how the device itself is formatted, commands like `mount` or `df -T` will show the filesystem type as Fuseblk. While we have looked at traditional filesystems implemented with Fuse, there are also various other modules that present information as a filesystem. If you have SSH access to a remote system but no networked filesystem shares on it, you can use SSHFS to mount it. Although largely superseded by the kernel's Ecryptfs, the Fuse EncFS filesystem can also store the contents of directories in encrypted form. Even less filesystem-like is MP3FS, which transcodes FLAC audio files to MP3 on the fly, so you can keep your music as FLAC but copy it to your player as MP3. These and more can be found at SourceForge: tinyurl.com/yfgmyyk.

LET THEM COME TO US?

So far we have looked at working with Windows filesystems on Linux: what about the other way around? And what about Mac OS X? OS X is easy: it can read most Windows filesystems. Working with Linux filesystems on either is possible but limited. There are drivers on SourceForge for ext2 for both Windows and OS X (the Mac one uses Fuse) but they don't work reliably with ext4, which has long been the standard filesystem for most Linux distros, so it's generally safest to have Linux work with them, rather than trying to persuade them to do things our way. You wouldn't want ext3 or ext4 on a USB flash drive anyway, as the journalling would wear it out faster (the same goes for NTFS) so you may as well stick with FAT or exFAT. ■

Fine-tuning Mavericks

The latest version of OS X brings a lot of improvements and a fair few — to put it gently — quirks. Matthew J.C. Powell shows how to make the most of the former and iron out the latter.

It's hard to complain about a free operating system, particularly one that offers as many new features as OS X Mavericks, released at the end of October. But when many people updated to Mavericks they found themselves in unfamiliar territory. Some parts of Mavericks work in ways quite different to previous versions of OS X, and sometimes the Mavericks way of doing things is well and truly, well, maverick. Here's how to make it make a little more sense.

KEEP THE LOCK SCREEN LOCKED

It's really cool that you can get notifications from various applications using 'Notification Center' even when your Mac is locked. It's a feature that's

borrowed from iOS 7, where you might hear a sound to indicate an update of some sort but you don't want to have to unlock your phone to find out what it is.

It makes sense on iOS 7, because your iPhone and your iPad are highly mobile devices that you take with you everywhere — their security is enhanced by the fact you're carrying them about your person. Your Mac — particularly if it's a desktop Mac — doesn't fit that category. When you lock your Mac (or let it lock itself) you're assuming a certain level of privacy. Mavericks isn't.

By default, 'Notification Center' puts banners and alerts on your lock screen when you get updates from Mail, Twitter, Facebook or many other apps. It may even include a preview of your mail

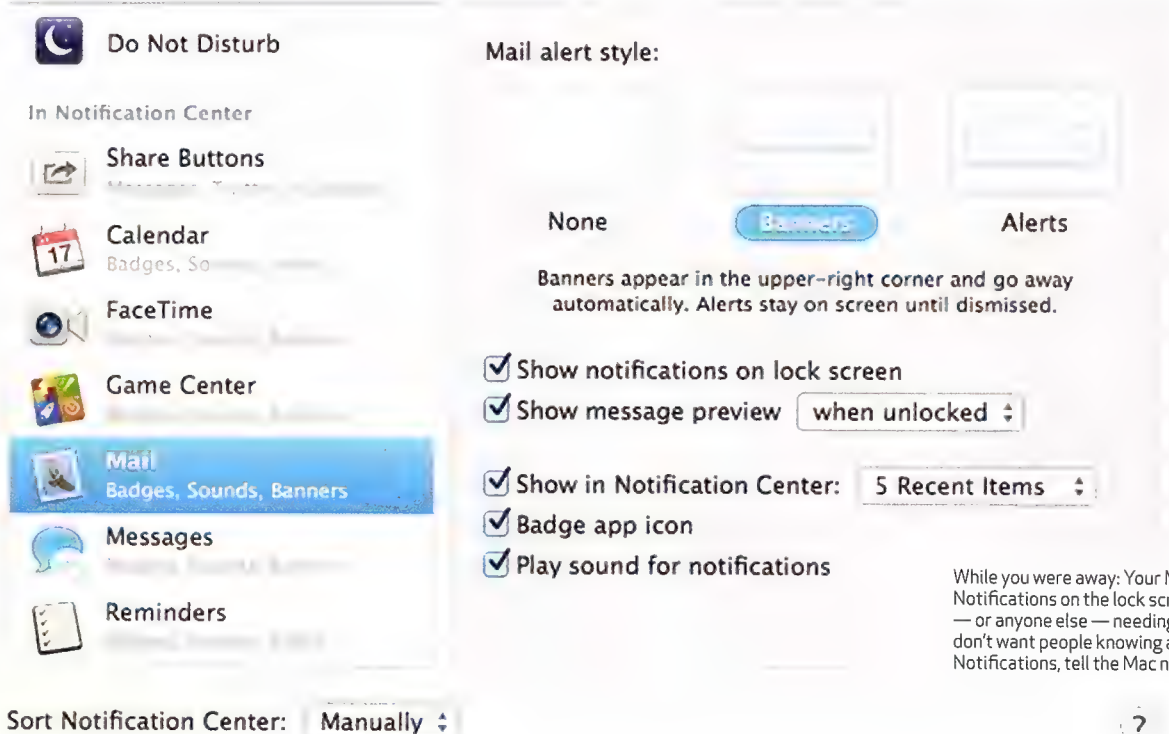
messages. It kind of defeats the purpose of locking your Mac.

You can change it though. In 'System Preferences', open the 'Notifications Pane'. In the left-hand column, you'll see a list of all the applications that work with 'Notification Center'. Click on each one, and on the right-hand side you'll see a tick-box indicating whether or not it will show notifications on the lock screen. We recommend deselecting that box for all applications, but your preferences may differ of course.

Unfortunately there's no way we can find for turning off Notifications on the lock screen for all apps at once (suggestion for 10.9.1, Apple?) so you have to do it on a per-app basis.



Notification Center shows your alerts in the upper-right of your screen, without interrupting what you're doing. Show and hide Notification Center by clicking its icon in the menu bar.



While you were away: Your Mac can display Notifications on the lock screen without you — or anyone else — needing to unlock it. If you don't want people knowing about your Notifications, tell the Mac not to do that.

STAY AWAKE!

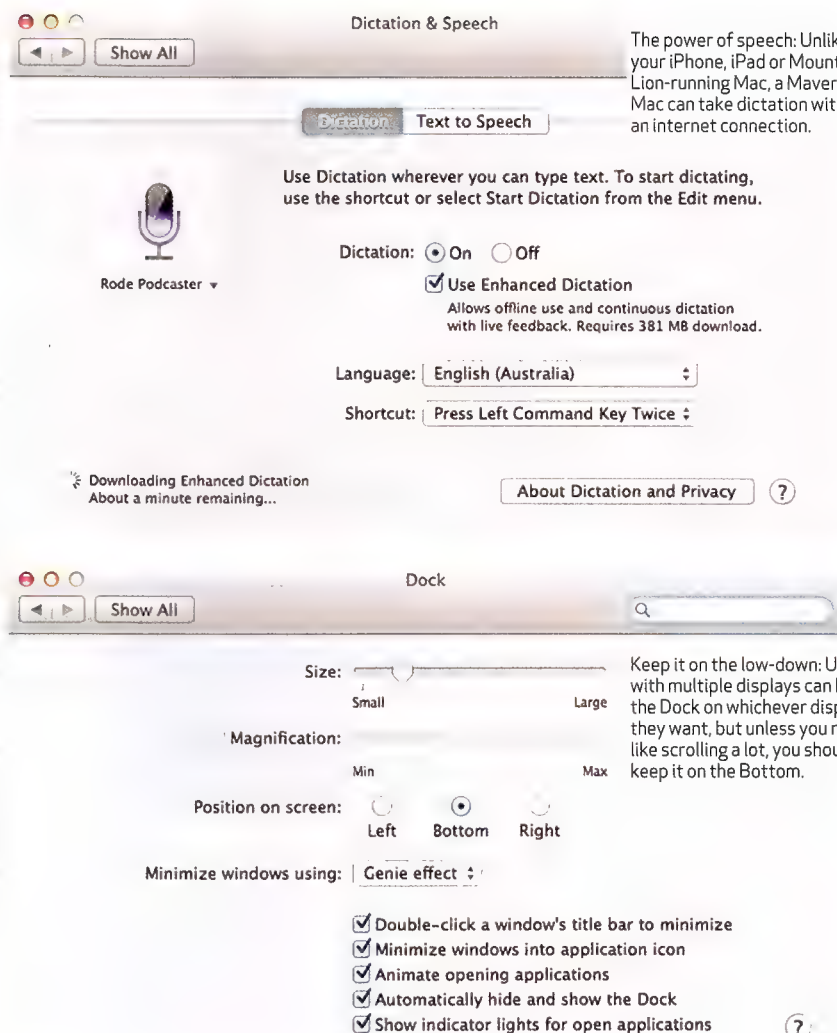
One of Mavericks's cooler features is App Nap — another one that started on iOS. App Nap monitors the activity levels of various applications in the background and, if they're not doing much, it puts it into a lower-power mode that allocates less CPU time to it. This saves batteries if you're on a laptop, and frees up precious CPU cycles to other processes whatever Mac you're on.

However, you may find that the slower performance of a particular app isn't to your liking, you can deactivate it on a per-app basis.

In the Finder, locate the app's icon and right-click (or double-tap if you're a trackpad user) on it, then select 'Get Info' from the contextual menu. If the app in question supports App Nap, you'll see a tick box to 'Prevent App Nap' near the top of the Info window. Tick that, and the app won't ever go to sleep in the background. (If you don't see the 'Prevent App Nap' option, it means the app doesn't support App Nap anyway, so it's not that cause of any slow-downs you're experiencing.)



Wake up sleepyhead: App Nap puts background apps into a lower-power mode to save batteries and boost performance, but that may not be what you want for a particular application.



The power of speech: Unlike your iPhone, iPad or Mountain-Lion-running Mac, a Mavericks Mac can take dictation without an internet connection.

SPEAK TO ME

Mountain Lion introduced system-wide Dictation to the Mac, using technology that started in Siri on iOS. Unfortunately, like Siri, it was network-based, with most of the processing happening on remote servers somewhere. If you were using your MacBook somewhere that didn't have a network connection, then no dictation for you.

Mavericks, on the other hand, acknowledges that your Mac has a fair chunk more processing power than your iPhone and might just be up to the task of doing the number-crunching itself. In order to do so, you first have to download some extra goodies.

Go to the 'Dictation & Speech' pane of 'System Preferences' and click on the Dictation tab. Click on the tick box to 'Use Enhanced Dictation' and the download will begin. As well as working offline, it's also a little bit faster and allows you to dictate longer sections of text without stopping.

WHERE DID THE DOCK GO?

A fairly simple trick, this one, but it's well worth knowing. If you have multiple displays hooked up to your Mac, you'll welcome most of Mavericks'

improvements to the way it now handles them. You can have different applications running in full-screen mode on different displays, for example, and you can define entirely different sets of Spaces for each display — more on this in a future column.

One thing that's still a bit awkward is the Dock. However many displays you have, you only have one Dock, and it only appears on one display at a time. So you may well find yourself using an application, needing to just quickly open up another one, going to the bottom of the screen and ... nothing. The Dock is anchored to another one of your displays.

Easy fix. When you go to the bottom of the screen, go there quickly — imagine you're tapping the bottom of the screen with the mouse pointer. Nothing will appear to have happened at first, but then take the mouse pointer to the bottom of the screen again and presto: the Dock!

One other thing worth noting is that the Dock's preferences treat all of your displays as if they are one big display. So if you tell it you want the Dock on the Left or Right rather than the Bottom of the screen, it will be on the Left of your left-most display or the Right of your right-most display. ■

Create a custom iPad newspaper

Feedly brings together all the latest new updates from your favourite sites in one place.

When Google retired its Google Reader service back in July, it did so because it apparently thought that RSS news feeds were a thing of the past. How wrong it was. RSS feeds make syndicating blogs, news and other web pages a simple affair, and enable users to quickly stay up to date with their favourite sites without having to trawl through a succession of web sites looking for the latest stories.

You can manage and access RSS feeds through Safari, but it's far simpler, more pleasant and easier on the eyes to use Feedly instead. This free app provides a convenient platform for monitoring all your web sites, allowing you to browse their latest updates via an attractive magazine-like interface, plus organise them into logical categories, so you can skip between different modes of work and pleasure depending on your mood.

CROSS-PLATFORM

Another benefit of using the Feedly app is that it's all part of a cloud-based service, so you can access your sites and categories from any computer with a web browser or other mobile devices. Better still, changes you make on one platform are synchronised across your other devices.

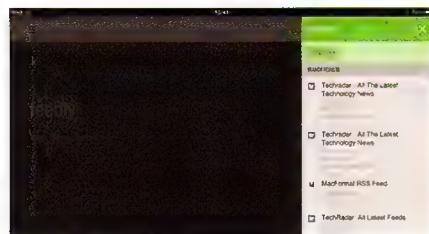
The app is straightforward to set up, and once signed up and logged in, you'll be able to quickly build a catalogue of all your favourite web sources, then organise them into categories for easy access. Organising your feeds this way has the added benefit of letting you amalgamate all the feeds from that category into a single list you can browse through in chronological order.

Clicking a story opens it in a new window, laid out neatly in a single column of text interspersed with the occasional image. It's a great way to read stories without the distracting clutter of its parent web site, but if you do need to view pages in their original environment you can ask Feedly to display the original web page instead.

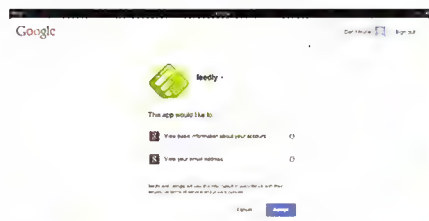
If you've been struggling to keep up with the flow of news and updates from your favourite web sites, Feedly will prove an incredibly useful tool now and going forward.

Step-by-step: Set up and use Feedly

Organise your RSS feeds for easy reading.



1 FIND A FEED
Launch Feedly and swipe up to read through a short series of orientation slides. Once done, tap the Search button to browse through a series of categories for popular web sites, or use the Search bar to search for a site or enter its web address if known.



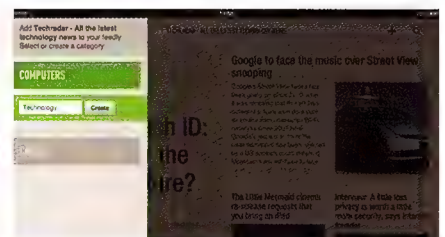
3 SIGN UP
Tap the + button to add the current feed to your catalogue, at which point you'll be prompted to sign into Feedly using a Google account. Follow the prompts to sign in (or sign up) using your account credentials, then tap Accept when requested.



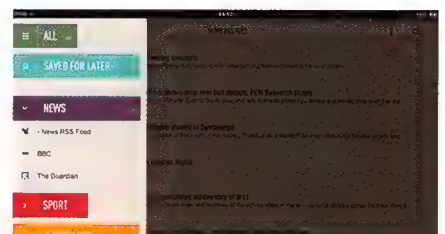
5 ADD MORE FEEDS
You can now tap the Search button again to locate more news feeds to use — the examples provided in each category tend to be geared towards US users, so you'll need to search for a feed or copy and paste its URL from Safari more often than not.



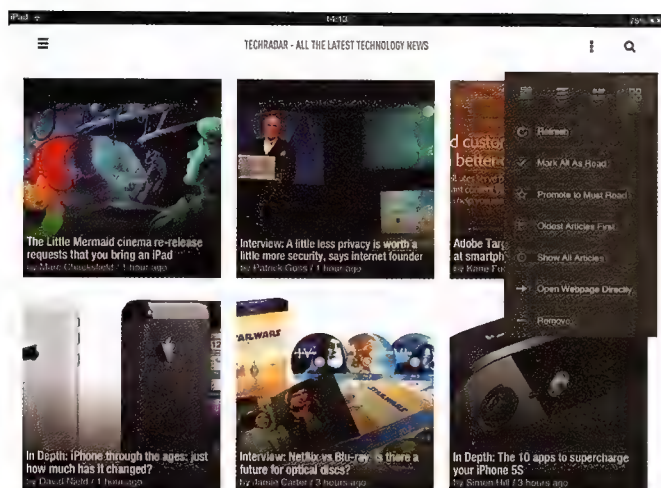
2 VIEW A FEED
Tap a feed to preview it — Feedly will choose an appropriate view from the four available (see step 7) to display the latest news stories from it. Tap a story to read it in its own window, or swipe up, or swipe up and down to navigate around the list.



4 SELECT CATEGORY
You'll now be asked to file your chosen news feed into a category — a suggested category will be listed, which you can tap to accept, or you can tap 'New Category' to set up your own: type the category name and tap Create — the feed is then filed inside it.

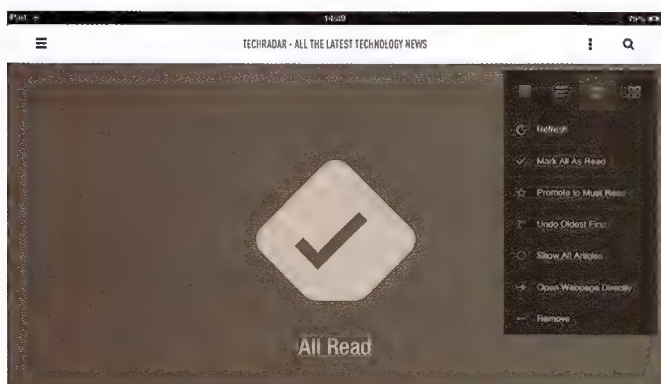


6 VIEW MULTIPLE SOURCES
Switch between feeds by tapping the menu button in the top-left hand corner followed by the > button next to a category name and selecting the feed you wish to browse. Alternatively, tap a category name to browse all unread stories within that category.



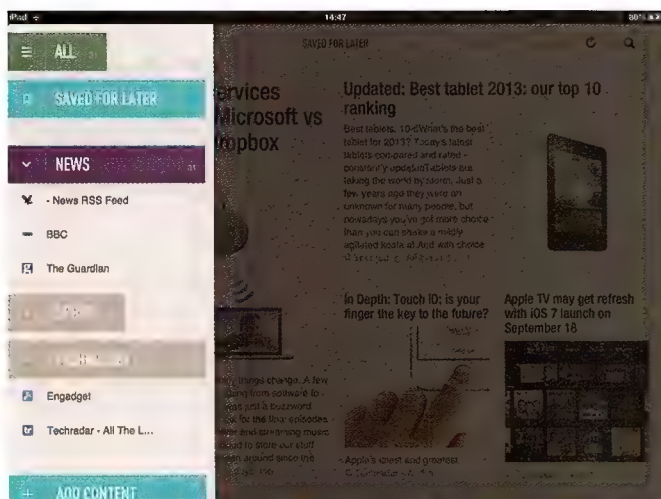
7 SWITCH VIEWS

If you don't like a feed's default view, change it by tapping the feed settings button next to the Search icon. Choose between four views: Titles-only (no images), List (small thumbnail), Magazine (title, summary and images) and finally Cards.



9 MANAGE FEED

Once opened, a story is marked as read and its headline greyed out. Tap the feed settings button to mark all other unread pages read if you have no interest in them. You can also manually refresh the feed from here to check for recent updates.



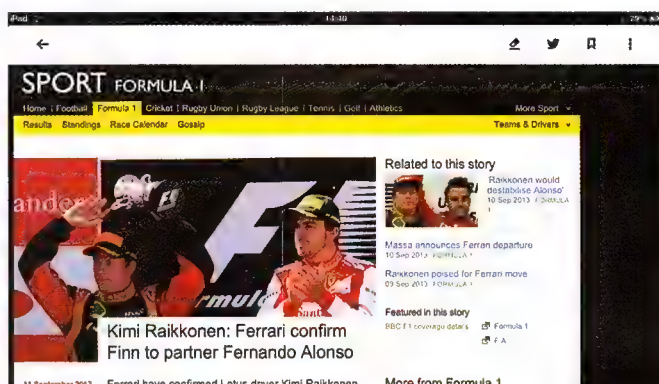
11 READ PREVIOUS ARTICLES

Tap the menu button and if you've saved any stories for reading later you can access them via the 'Saved for Later' category. Tap this, then tap the story you wish to read. When you're finished, untap the 'Save for Later' button before quitting.



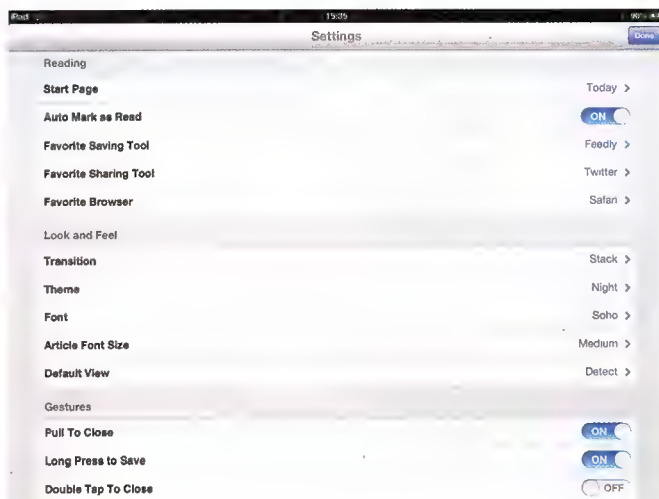
8 READ AND SHARE

When you tap a story's headline it'll open in its own window, allowing you to read it. Forward on the story to others using the Share button — a wide range of services are supported — or tap the bookmark button to its left to save the story to read later.



10 OTHER OPTIONS

The feed settings button also allows you to reverse the sort order stories are shown in, load all articles in the feed (not just updates), instruct Feedly to open the web page directly when a story is tapped, or remove the feed completely from your account.



12 TWEAK MORE SETTINGS

Scroll down the menu to access the Settings section — tap 'Recently Read' to view a history of recently opened articles, or tap 'Switch Theme' to toggle between the daytime theme and a night-friendly one. Finally tap 'Advanced Settings' for more options.

Make your Android lockscreen do more

Android's lock screen widgets are great, but can be improved. Simon Chester shows you how.

When Android released official implementation of lock screen widgets in version 4.2 (something that Widget Locker had been offering for years), many breathed a sigh of relief: "Now I no longer have to unlock my phone to get access to important info! This will shave literally seconds off of my day." There was much rejoicing.

However, after implementation, it became quite clear that the promised increase in productivity was somewhat negated by the need to have to swipe between screens in order to access the different widgets, as you could only place one widget per screen. There was much disappointment.

There was also innovation, however, as developer (and ex-Googler) Roman Nurik decided that he would overcome this one-widget-per-screen problem by creating a lock screen widget that can be customised to show whatever you want. Better yet, he made it an open platform so that other developers can build plug-ins to support whatever information or inter-app communication that they wish. Again, there was much rejoicing.

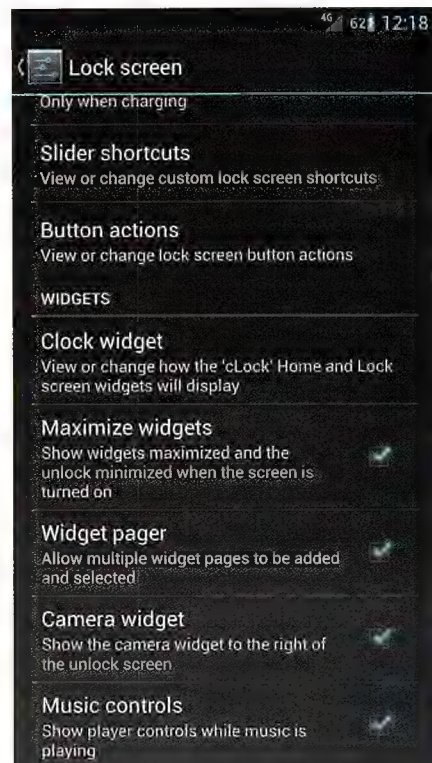
So, to jump on-board this super-convenient, productivity-improving, workflow-streamlining bandwagon, the first thing you need to do is download

Roman Nurik's (free!) DashClock. Like with most widget programs, to start using it, you need to first add a widget. As this is a lock screen widget, first lock your device, then scroll to the left and press the big '+' symbol, followed by the DashClock panel.

CUSTOMISE YOUR WIDGET

You will be asked to choose which extensions you want included on the widget. Natively, the app supports: weather; the number of missed calls, SMS; or Gmails; your next calendar appointment; your next alarm; and any others added through the apps you already have installed on your device. Note that most extensions will only appear on your lock screen when there is something relevant to show you – for instance, the missed phone call extension will only show up when you've missed a call. So, pick those that you want from the list, then re-order them by dragging them up and down. You can remove any you've accidentally selected by swiping them off of the screen.

You can also install more extensions by pressing the menu button, and choosing 'Get more extensions', which will take you to a list of third-party extensions on the Play Store. The most popular ones include Facebook/Messenger, WhatsApp,



You can change the default size of the widget in 'System Settings'.

Hangouts (ex Google Talk), detailed battery stats, Tasker integration (allowing you to create any alert for any event), Sound Search (for starting Shazam etc from your lock screen), inspiring quotes, and many, many more.

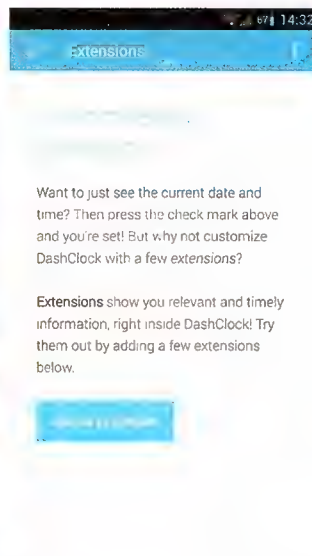
You can change the settings for each of the extensions – as well as set them up – by pressing on the little settings icon on the right.

DON'T MISS IT!

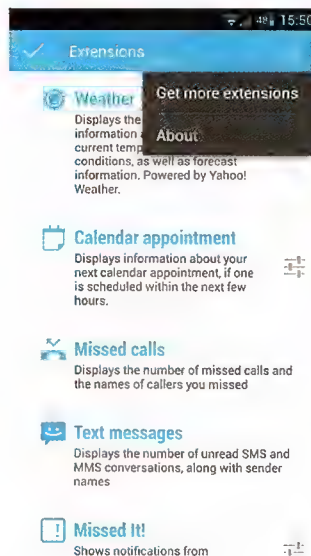
If you already use the excellent Missed It! notifier widget on your homescreen, and want to carry its functionality over to



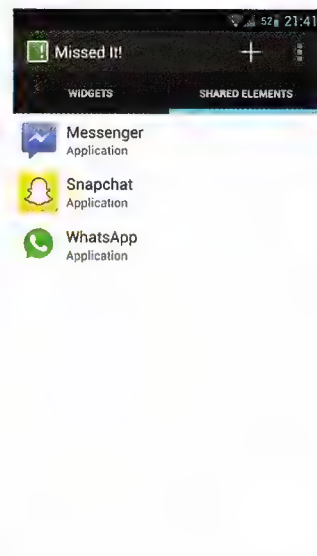
Adding a new widget to your lockscreen is as easy as swiping to the left.



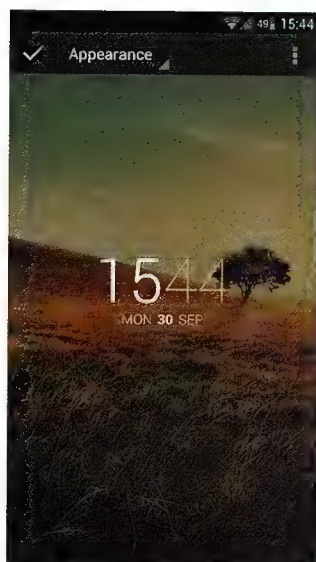
Upon first opening DashClock, you'll be prompted to add extensions.



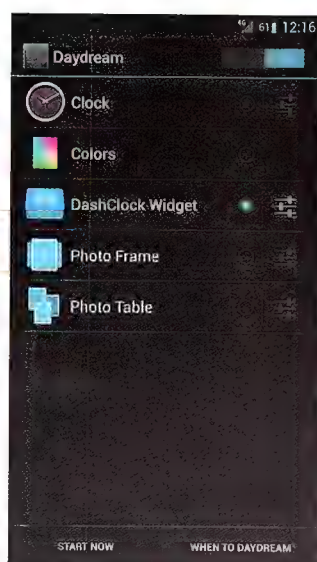
Add more extensions to add different info to your lock screen.



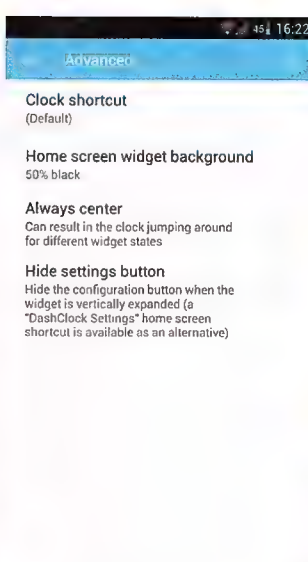
The Missed It! app can send notifications to DashClock.



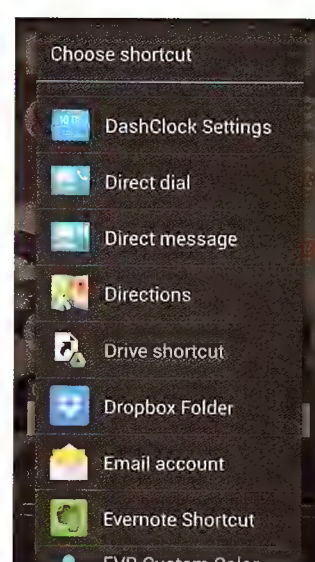
DashClock comes with a number of time and date fonts and layouts.



You can use DashClock as a Daydream screensaver.



Be sure to check out the Advanced menu for extra tweaks.



DashClock settings can also be accessed through a homescreen shortcut.

DashClock, you can choose the Missed It! extension from the list.

To get it working, however, you need to open the Missed It! app, and go to the 'Shared Elements' tab to choose which apps you want to be notified of via DashClock. Note that only Application type notifications will work in DashClock – meaning no missed calls, SMS, or Gmail here – but we've found that the in-built DashClock functionality for those is superior, anyway.

Once you've selected all the extensions you want displayed on your widget, change the drop-down menu up the top to Appearance, where you can choose between several layouts for the time and date – just flick them to the left or right to find the ones you like.

DAYDREAM BELIEVER

Also worth exploring is the Daydream menu. Daydream is effectively a screensaver equivalent for Android 4.2+ that can be shown while your device is charging or docked.

To enable Daydream on your device either, visit 'System Settings > Display > Daydream', or press 'System Daydream settings' from within DashClock.

You can then select which Daydream (screensaver) you wish to display – for this purpose (obviously) select DashClock. Within DashClock, you can choose the colour of the text, as well as the type of animation used on the widget (be aware though that static widgets may burn into your screen).

And, finally, you should also check out the Advanced menu, where you can change things like: which app will open when you touch the clock; if the clock should always remain centred (which will cause the clock to change positions when you minimise and maximise the widget); the background transparency of the widget; and if you want the settings

icon to appear on the widget or not (you can always access the settings from a homescreen shortcut – just long-press the home screen, then choose 'Shortcuts > DashClock Settings').

When you're done, just press the tick in the top left corner, and your widget will now appear on your lock screen. You'll notice that your old lock screen clock/widget will still be there, so, from your lock screen, hold the old clock/widget until it starts floating, then drag it to the remove section up the top.

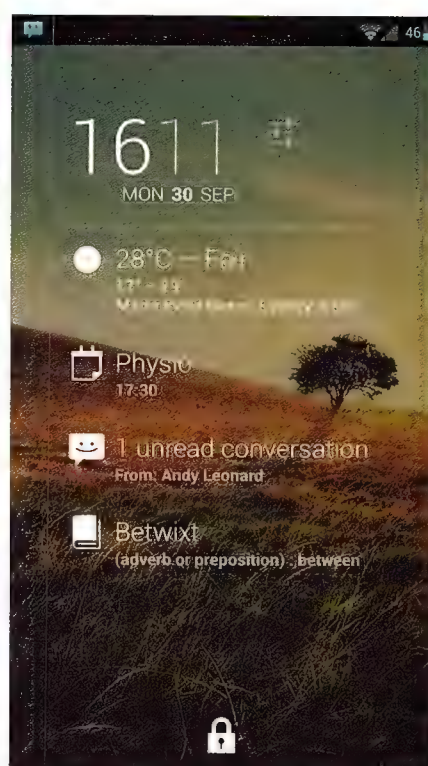
The widget, by default, appears in a minimised state on your lock screen,

with just the clock, and limited info appearing to the right of it. If you swipe down on the widget, it will expand to take up the full screen, and provide much more info.

It may be worth your while to head over to the 'System Settings > Lock screen' menu to fiddle with some of the options there. While they'll differ from ROM to ROM, you should have an option to maximise widgets, so that you always get the full widget displayed when you turn on your screen. You then access your screen unlock pattern/pin by pressing the unlock icon. ■



The minimised DashClock widget.



The maximised DashClock widget.

Create a Word document with a macro

Helen Bradley explains how to create a question and answer Word document using a macro.

Writing a macro to create an entire document in a Q & A format involves some interesting VBA challenges. Typically when you run a macro you will have it perform a specific task and then hand back control of the document to you. However, when you need the macro to provide a series of questions one by one you won't want it to hand control back but rather to sit and wait until you are ready for the next question. This is the issue we'll look at in this month's Word macro project.

THE BASICS OF THE SOLUTION

The macro we will create will be run using a form which will have a button you will click to insert a question into a Word document. It will then wait as you type your answer so that, when you are done, you can click the button again to make the next question appear and so on. The solution needs a user form with a button that you click to get each question in turn and one to exit the routine.

One of the challenges is that the form must stay visible on the screen while the answer is being typed so, when you are done, you can click to get the next question. This isn't behaviour that is typical, for example, of dialogs in Word. Usually you have to finish working with a dialog and close it before you can work on the document. The secret to forms which stay visible is to open them as modeless – this lets you switch between the form and working on the document and it's a great option for macros like ours.

This code in a module in our document will launch the form QandA as a modeless form:

```
QandA.Show vbModeless
```

DELIVERING THE QUESTIONS

Now that we can keep the form open while the user works we need to serve up the questions to the user. This can be done using a single command button which, when clicked, provides the next question in a series. A Public variable called QuestionNumber will

keep track of the current question number and can be incremented each time a question is added to the document. A 'Select Case' statement lets us check the current value of the variable and provide the appropriate question each time the user presses the button on the form. A 'Select Case' statement works well when you have a large number of values to test for – in our case, potentially a large number of questions – it is neat, easy to read and write and to understand.

CONTROLLING FOCUS

If we were to implement the solution outlined so far one issue would

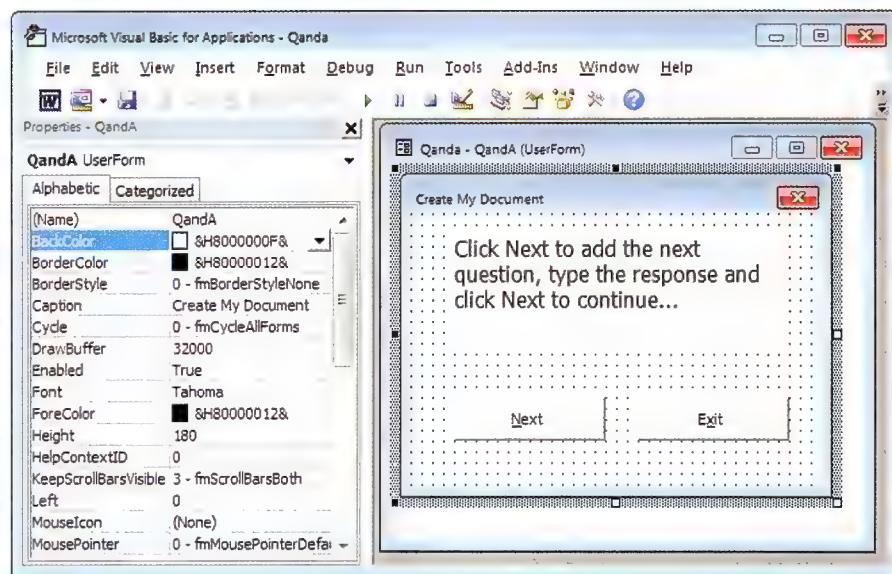
become immediately apparent and that is that the form retains the focus even after a question has been added to the document. The result

is that the user must click in the document before they can start typing. It's an extra keystroke and it is easy to forget to do so it makes the macro a little cumbersome to use. The solution is to set the focus to the Word document once the question is added to it.

Unfortunately there is no VBA command to set the focus back to the Word document and, instead, we need to resort to using a pair of API functions. One function gets details of the Word window and the other sets the focus



Step-by-step: Create the solution



1 SET UP THE FORM

Open a new Word document, launch the Visual Basic editor and choose 'Insert > Form'. Create a form with two command buttons, one captioned 'Next' and the other 'Exit'. Add a Label with user prompts and set the form's Name property to QandA and its Caption to whatever you like.

to that window when required.
Here is the code for the form:

```
Option Explicit
Private Declare Function
GetForegroundWindow Lib
"user32" () As Long
Private Declare Function
SetForegroundWindow Lib
"user32" (ByVal hWnd As Long)
As Long
Private hWnd As Long
Public questionnumber As
Integer

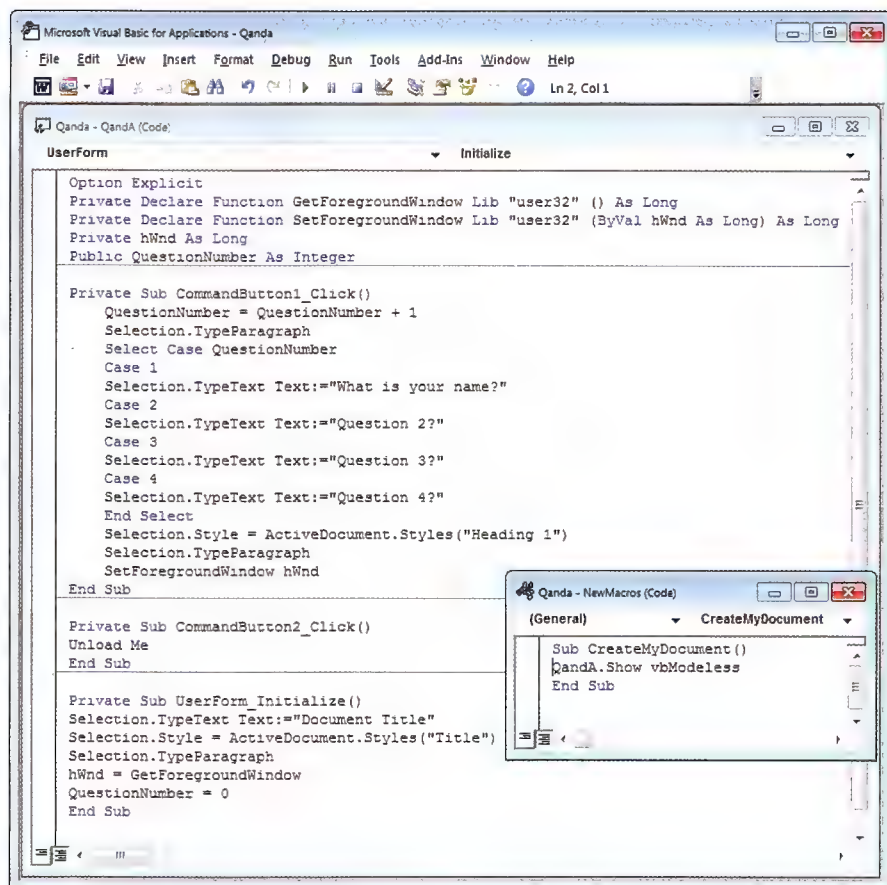
Private Sub CommandButton1_
Click()
    questionnumber =
questionnumber + 1
    Selection.TypeParagraph
    Select Case
questionnumber
        Case 1
            Selection.TypeText
Text:="What is your name?"
        Case 2
            Selection.TypeText
Text:="Question 2?"
        Case 3
            Selection.TypeText
Text:="Question 3?"
        Case 4
            Selection.TypeText
Text:="Question 4?"
        End Select
        Selection.Style
= ActiveDocument.
Styles("Heading 1")
        Selection.TypeParagraph
SetForegroundWindow
hWnd
    End Sub

Private Sub CommandButton2_
Click()
    Unload Me
    End Sub

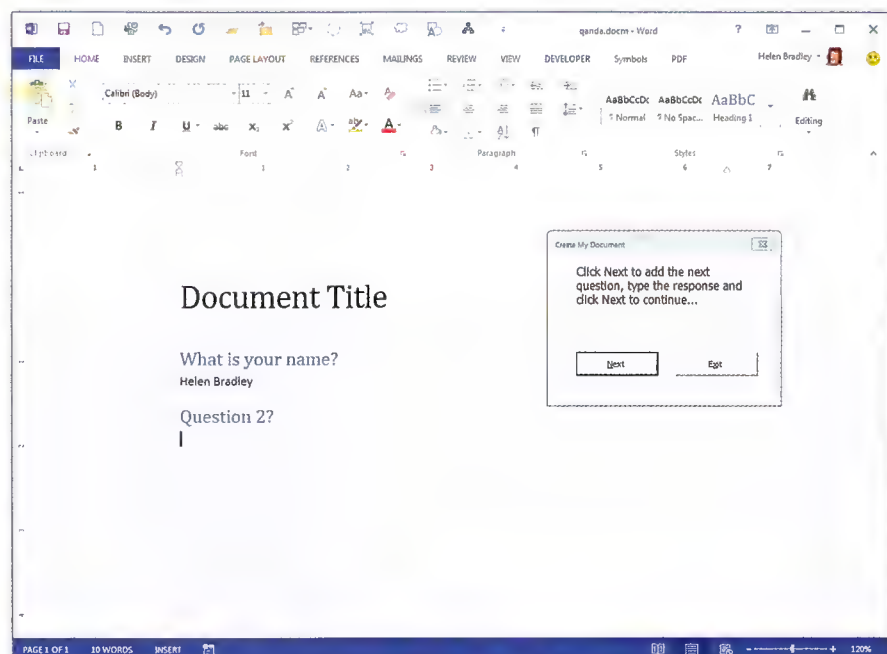
Private Sub UserForm_
Initialize()
    Selection.TypeText
Text:="Document Title"
    Selection.Style =
ActiveDocument.Styles("Title")
    Selection.TypeParagraph
    hWnd = GetForegroundWindow
    questionnumber = 0
    End Sub
```

And this is the code to add
to the module:

```
Sub CreateMyDocument()
    QandA.Show vbModeless
End Sub
```



2 ADD THE CODE
Choose 'Insert > Module' and add the code to make the userform display the form whenever the user runs the macro. Type the remainder of the code into the form's code area — to get to this double click a button on the form.



3 TEST THEN CUSTOMISE
Save the file as a .docm file and then test it by running the macro. The macro adds a title to the document and then, on each press of the Next button it adds another question to the document. Once tested, you can edit the macro to customise it to your own needs. ■

Animate infographics with CSS

Every infographic tells a story. Val Head guides you through bringing a web-based infographic to life with CSS animations and a touch of jQuery.

Combining both CSS animations and CSS transitions, this month we'll be using CSS to animate a timeline infographic. The data unfolds as you scroll down the timeline – each animation is triggered via the `inview` jQuery plug-in when it comes into view. We'll look at the components of the three main animations on each year in the timeline.

Every infographic tells a story. I chose the story of how Web Design Day (www.webdesignday.com) has grown over the last four years. This is the data we'll be using in our example project.

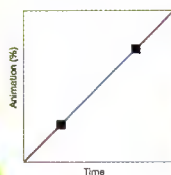
Code snippets the unprefix W3C syntax for all CSS3 properties for easier reading. The final CSS in the example files has all necessary prefixes thanks to `autoprefixer` (github.com/ai/autoprefixer). Also note that demo files need to be run on a web server (local via something like MAMP, or FTPed up to your web host) to execute correctly.

Before coding any of the animations, consider what's the most interesting data and the overall feel you want to achieve. For Web Design Day, the total number of attendees, plus the furthest distance travelled to attend, were interesting points to compare.

As we scroll to each year, the date pops into view to mark a point on the timeline. To get these in motion, we start by writing a set of keyframes that describe the animation we want to see. After some trial and error with `CodePen` (codepen.io),

GRAB THE FILES

Download the files you need from: www.apcmag.com/magstuff.htm



Code snippets, short and long hand:

```

~webkit-transition: all 500ms cubic-bezier(0.250, 0.250, 0.750, 0.750);
~ms-transition: all 500ms cubic-bezier(0.250, 0.250, 0.750, 0.750);
~ms-transition: all 500ms cubic-bezier(0.250, 0.250, 0.750, 0.750);
~o-transition: all 500ms cubic-bezier(0.250, 0.250, 0.750, 0.750);
transition: all 500ms cubic-bezier(0.250, 0.250, 0.750, 0.750); /* linear */

~webkit-transition-timing-function: cubic-bezier(0.250, 0.250, 0.750, 0.750);
~ms-transition-timing-function: cubic-bezier(0.250, 0.250, 0.750, 0.750);
~ms-transition-timing-function: cubic-bezier(0.250, 0.250, 0.750, 0.750);
~o-transition-timing-function: cubic-bezier(0.250, 0.250, 0.750, 0.750);
transition-timing-function: cubic-bezier(0.250, 0.250, 0.750, 0.750); /* linear */
    
```

If this saves you time, or blows your mind, consider making a [Donation](#) to keep these projects alive.

Resources

I arrived at this:

```

@keyframes popIn {
  0%{transform:scale(0)};
  70%
  {transform:scale(1.05)};
  100% {transform:scale(1)};
}
    
```

Our `popIn` animation starts with a transform scaling our element to a size of 0, which essentially renders it invisible to start its entrance from. Then, 70% of the way through the animation, we assign a scale of 1.05, which will display our element just a bit bigger than its assigned 110px diameter. Finally, it settles at its true assigned size, a scale of 1, at the last keyframe of our animation (100%). This keyframe declaration won't animate anything on its own. The animation needs to be assigned to an element to take effect,

using the `.date-anim-in` class:

```

.date-anim-in {
  animation:popIn .4s cubic-
  bezier(0.6, -0.28, 0.735, 0.045)
  both;
}
    
```

Any element we assign the `.date-anim-in` class to will take on the `popIn` animation, take 0.4 seconds to complete the animation, use the animation-timing-function property defined in our cubic-bezier function and have an animation-fill-mode of both.

Note that in our HTML we only assigned the class of `.date` to our year marker, not the `.date-anim-in` class that we've just created. We'll assign the `.date-anim-in` dynamically using jQuery to control exactly when the `popIn` animation executes. Without writing any additional CSS, we'll also be able to reuse it to animate the other date markers, or even other elements entirely if we wanted.

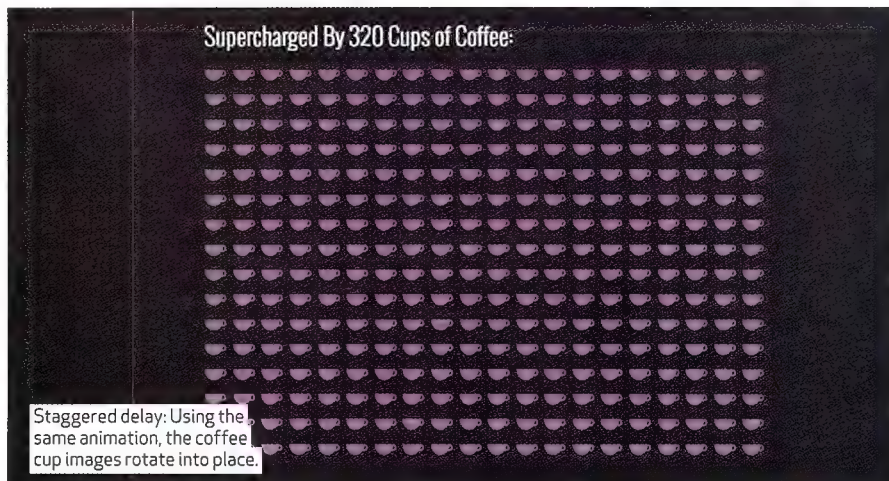
THE BAR CHART ANIMATION

Our bar chart illustrates the number of veggie dogs, hot dogs and pierogi consumed at lunch each year. The width of each bar animates to its total length while the illustrated label for each bar fades in as the bars expand. The expanding motion is achieved with a CSS transition and some clever nesting. A CSS animation is used for the fading.

First, the HTML for each bar of our bar chart is structured like this:

```

<div class="veg item">
  <div class="bar"></div>
    
```




```

<div class="label">
<span>24</span><br/></div>
</div>

```

Each food item contains a `<div>` that will represent its bar in the bar chart as well as a `<div>` with its label. There's an additional `<span>` around the total number for each item so we can easily pull that out with jQuery to assign the width to each bar later on. This helps keep the animation we're creating reusable across each year's bar chart. The CSS behind the motion of each chart is exactly the same, even though the data isn't. The `<div>` with the class of `veg`, `pierogi` and `meaty` will determine the width for each section of the chart. Each `child.bar <div>` is assigned the width of 100% in our CSS:

```

.bar {
width:100%;
height:2rem;}

```

Now, we can alter the timing of how each bar in our chart grows by assigning a transition to the parent element. For maximum effect, the bars expand in order and appear to grow on top of one another: first `veg`, then `pierogi`, then `meaty`. This is achieved by assigning a transition property to each and staggering the associated amount of delay:

```

.veg {
z-index: 100;
width:0;
transition: width .5s
ease-in;}
.pierogi {
z-index: 50;
width:0;
transition: width .75s
ease-in .2s;}
.meaty {
width:0;
transition: width 1s ease-
in .2s;}

```

All three sections of the bar chart have an initial width of 0 to start with and a `z-index` set to preserve the visual layering order. For example, `veg` will obscure the transition occurring on `pierogi` until it transitions to a width wider than the `veg <div>` layered above it. Each section has a transition for its width with a slightly different duration (the first number in the shorthand) and delay (the second number in the shorthand) to create the staggered expanding effect. When the total width is assigned to each of these `<div>` via jQuery, the transitions are triggered and the `child.bar` element will grow along with each.

Our nested label text and image get their motion in a similar manner. Our `<div>` with the class of `label` (containing text and image) is positioned to the right of its parent. As the parent element

CUBIC BEZIER AND TIMING FUNCTIONS

The easing values we choose for an animation can completely change how the animation is perceived. We can use easing to suggest the weight, mass and personality of the object we're animating. It's a very powerful (and fun) thing!

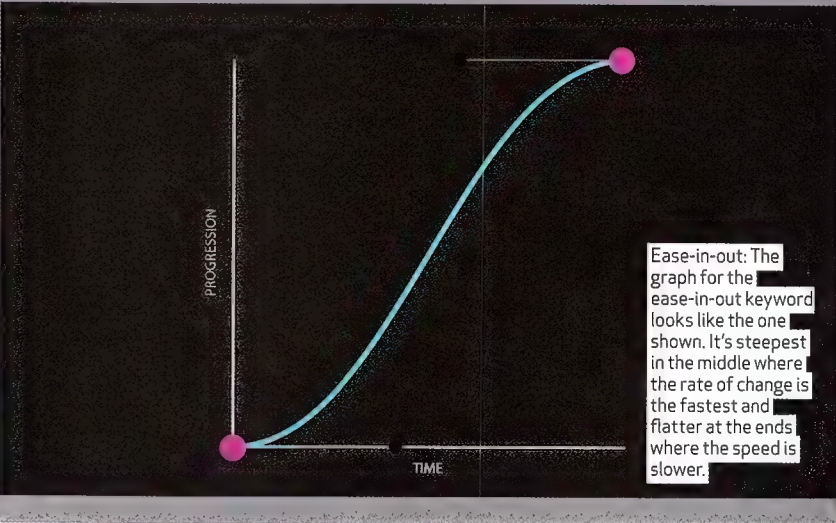
Luckily, we have a whole slew of options for defining or easing the animation-timing-function our CSS animations will use. The `animation-timing-function` property has a few keywords we can use to assign specific easing: `ease`, `ease-in`, `ease-out`, `ease-in-out` and `linear`.

In addition to these keywords, we can create nearly limitless options for our easing by defining custom cubic Bézier curves, which are typically illustrated by plotting the progression of the changing property against the time that change takes. The steeper the

curve is, the faster the rate of change, and the flatter the curve is the slower the change.

Each cubic Bézier curve is defined by four values, typically between 0 and 1, which describe the curve to be drawn. Thankfully, we don't have to come up with these numbers all on our own. There are some very useful tools out there for us: **Ceaser** (matthewlein.com/ceaser) by Matthew Lein provides a number of presets, including some based on Robert Penner's popular easing equations, as well as the option of your own custom cube. Lea Verou's **cubic-bezier.com** (cubic-bezier.com) is helpful for comparing the difference between different easing options.

For more details on how the curves work, try reading Kirupa Chinnathambi's article on easing functions (tinyurl.com/lee2r9d).



`cubic-bezier(.17,.67,.83,.67)`

Preview & compare

Duration: 1 second



Library

Click on a curve to compare it with the current one.



ease



linear



ease in

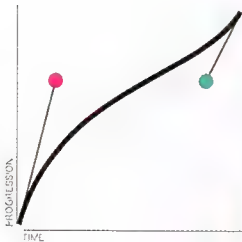


ease out



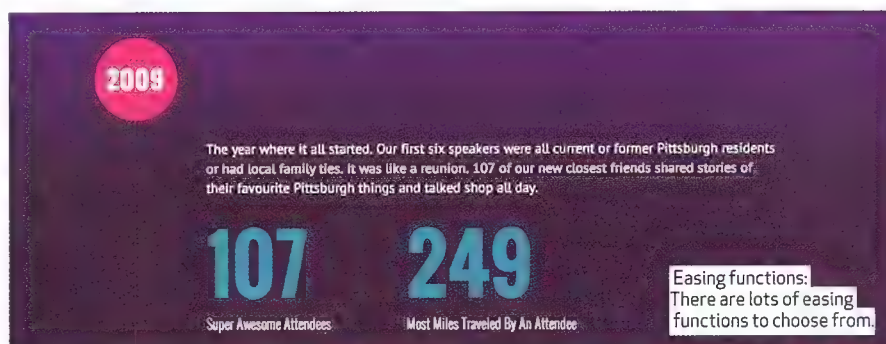
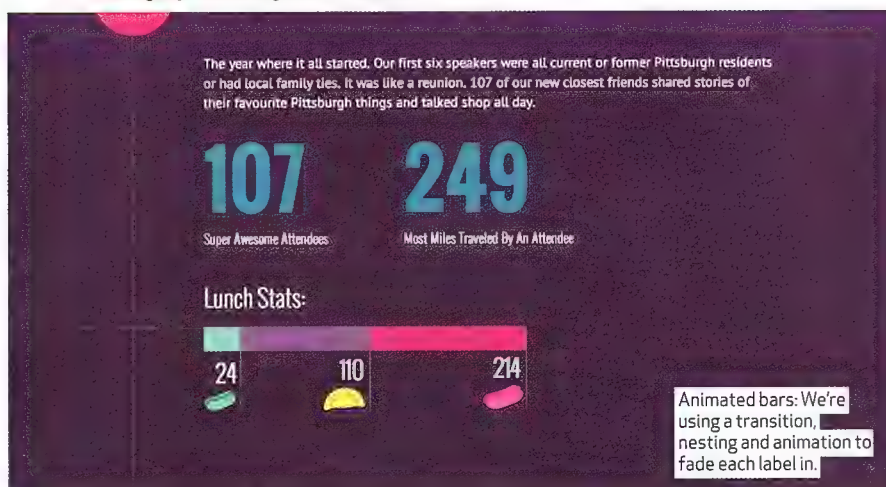
ease in out

Tip: Right click on any library curve and select "Copy Link Address" to get a permalink to it which you can share with others



Easing in: cubic-bezier.com helps compare common CSS easing keywords.

Web Design Day: A few facts and figures about the conference and its attendees.



expands, the label moves along with it too.

There's just one more thing I wanted to add to the expanding bar chart animation. It was really distracting to see the images and text of the labels awkwardly piled on top of each other near the beginning of the animation when all three bars were almost the same width. The labels overlapped and looked garbled. To help minimise the visual overlap, I added an animation to fade in each label while the bars expanded.

The fadeUp animation's keyframes start with an opacity of 0 and end at 1. We also have four different classes ready to assign this animation in various configs.

```
@keyframes fadeUp {
  from {opacity:0;}
  to {opacity:1;}
}
.fade-down {
  animation: fadeUp .15s
  ease-out reverse both;
}
.food1 .label {
  animation: fadeUp 0.5s
  ease-out 0.75s both;
}
.food2 .label {
  animation: fadeUp 0.5s ease-
  out 1s both;
}
.food3 .label {
  animation: fadeUp 0.5s
  ease-out 1.25s both;
}
```

The .fade-down class may look a little funny at first. We're assigning the animation of fadeUp but also setting the animation-direction property to reverse via the shorthand. This will execute the keyframes in the opposite order they're listed (opacity of 1 to an opacity of 0). So, we can use this one set of keyframes to fade elements in or out, depending on the animation-direction we set. We create three additional classes to use for the fading in of our bar chart labels. We use the same fadeUp keyframes on each, but with a different animation-delay value.

When we assign the .food1, .food2 and .food3 classes via jQuery, the labels within each will be assigned to our fadeUp animation with staggered amounts of delay. Creating different configurations of the animation properties, gets you lots of mileage from a single keyframe declaration. This reusability is one of my favourite CSS animation features.

The amount of coffee drunk at the conference was begging to be displayed in this infographic. Each coffee cup image represents two cups of coffee consumed to prevent things getting too visually overwhelming. The cups swing into place with a bit of spring to them and appear with staggered timing. We accomplish this with animated 3D transforms and a handful of :nth-of-type rules.

To make the cups appear to rotate in 3D space, we'll rotate them around the y-axis. HTML elements lack any depth, so the cups are essentially postcards in space:

they have a front and a back, but if we look at them from the side, they're essentially invisible because they're infinitesimally thin. The keyframes look like this:

```
@keyframes swingIn {
  0% {
    transform: rotateY(90deg);
    animation-timing-function:
    cubic-bezier(0.875, 0.03, 0.685,
    0.22);
  }
  5% {
    opacity: .5;
    animation-timing-function:
    linear;
  }
  60% {
    transform: rotateY(-20deg);
    animation-timing-
    function: cubic-bezier(0.165,
    0.84, 0.44, 1);
  }
  100% {
    opacity: 1;
    transform: rotateY(0deg);
  }
}
```

We also set the perspective property on our parent element so all our coffee cups rotate using the same perspective:

```
ul.cups {
  perspective: 800;
  ...
}
```

Over the course of this animation, both the opacity and the rotation of the cups are affected at different rates. It starts with a 90-degree rotation around the y-axis, which means our paper-thin image is rotated and can't be seen. It ends with a rotation of 0 degrees, which means it's flat to the screen. It rotates past its final position to create that little bit of a bounce back into place.

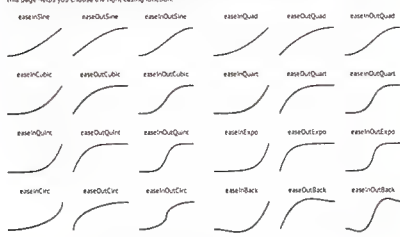
The animation-timing-function is also set differently between keyframes to maximise the 'snappiness' of the movement. You can't animate the animation-timing-function property, but you can set it to different values between keyframes. The animation-timing-function defined in our 0% keyframe will be used between the 0% and 5% keyframes and so on through our keyframes as each new animation-timing-function property is declared within a keyframe rule.

Similar to the fadeUp animation for the bar chart labels, the animation for the cups is assigned to the in each list, using a number of classes. In this case, since the total number of cups varies so greatly, the :nth-of-type pseudo-class selector is used to assign different animation-delay property values to the cup in groups of 10. As the cup list comes into view, each will be assigned the class of .swing-in via jQuery. The :nth-of-type rules in our CSS will determine the animation properties assigned to each individual cup :

```
.swing-in:nth-of-type(2n+1) {
```


Easing functions specify the rate of change of a parameter over time.

Objects in real life don't just start and stop instantly, and almost never move at a constant speed. When we open a drawer, we first move it quickly, and slow it down as it comes out. Drop something on the floor, and it will first accelerate downwards, and then bounce back up after hitting the floor. The page helps you choose the right easing function.



Date marker: We'll assign a class via jQuery to have the date marker animate in.

```
animation: swingIn 0.9s
0.75s;
}
```

These classes use the .swing-in class to set an order for the elements to take on the swingIn animation. The elements also have varying values for animation-delay property (the second number in the shorthand). These override each other causing the cups to animate in groups of 10, giving the animation an almost striped look as the cups all appear from assigning one class. I used a Sass loop to create these rules with incremental amounts of animation-delay.

Now let's take a look at the JavaScript that's taking care of the logic and playing conductor to all our CSS animations and transitions in our infographic.

TRIGGERING THE ANIMATIONS

Each of our animations needs to be triggered as it comes into view based on how far down the page we've scrolled. There are a number of libraries and scripts that can give us that sort of information. I've chosen to use the inview jQuery plug-in (tinyurl.com/nptfsvd). This can fire an event whenever a particular element is within the visible viewport area. Using that event, I assign the CSS classes containing my animation properties when the element in question is visible and then remove it when it's not. CSS animations execute when they are assigned. So, adding and removing a class with animation properties in this way essentially re-triggers an animation each time it's added. Remember our .date-anim-in class that had the animation properties our date markers used? We can assign it to each year's marker as it comes into view:

```
$("#date").bind('inview',
function(event, visible,
visiblePartX, visiblePartY) {
if (visible) {
$(this).
addClass('date-anim-in');
} else {
$(this).
removeClass('date-anim-in');
}
});
```

Using the inview plug-in, we look for a <div> with the class of .date and add the

CSS ANIMATIONS SHORTHAND

Shorthand properties keep the repetitive stress injuries at bay while we're animating in CSS. The CSS animation shorthand looks like this:

```
animation: myAnimation 1s
ease-in-out 2s 4;
```

There's a @keyframe declaration with the name of myAnimation defined elsewhere in the CSS. You're assigning that animation to an element with a one-second duration and ease-in-out easing, delaying two seconds before the animation starts, and repeating the animation four times.

Below is a list of CSS animation properties. The order of the shorthand probably varies across examples you've seen online, though they all work just fine. Sometimes the order of similar terms (the number values for duration and delay) is more important than the overall order.

ANIMATION-NAME

The name of the animation you want to assign to the element. A keyframe declaration with the same name must also exist elsewhere in your CSS.

ANIMATION-DIRECTION

The direction in which the animation

should play. This is normal by default. The options of reverse, alternate and alternate-reverse are also possibilities you'll find here.

ANIMATION-TIMING-FUNCTION

The type of easing to be applied over the course of the animation.

ANIMATION-ITERATION-COUNT

The number of times the animation should repeat. The default value is 1.

ANIMATION-FILL-MODE

Possibly the most useful animation property, this defines how the styles from your keyframes should be applied to the element before the animation starts (during an animation-delay) or after the animation has completed. This screencast shows the various values in action: (tinyurl.com/n79jncj)

ANIMATION-DELAY

Adds the time between the point at which the animation is assigned and when you start seeing visual results.

ANIMATION-PLAY-STATE

By default, all CSS animations have play state of running, but you can also set this to paused to stop the animation at any point in its duration.

.date-anim-in class when it's flagged as being visible. When added, the associated animation properties are applied and our date marker animates with the popIn animation. When it's not visible, the .date-anim-in class is removed. The .date <div> is returned to its intrinsic styles ready to re-assign when it comes back into view. Our year markers are now popping in as we scroll down the timeline. While the cups are controlled in the same way, bar chart animations have more going on:

```
$("#nine .food").bind('inview',
function(event, visible,
visiblePartX, visiblePartY) {
if (visible) {
$("#nine .veg").
removeClass('fade-down');
addClass('food1').css('width', $("#nine .veg .label
span").text()*2);
$("#nine .pierogi").
removeClass('fade-down');
addClass('food2').css('width',
$("#nine .pierogi .label
span").text()*2);
$("#nine .meaty").
removeClass('fade-down');
addClass('food3').css('width',
$("#nine .meaty .label
span").text()*2);
```

```
} else {
$("#nine .veg").
toggleClass('fade-down food1').
css('width', '0px');
$("#nine .pierogi").
toggleClass('fade-down food2').
css('width', '0px');
$("#nine .meaty").
toggleClass('fade-down food3').
css('width', '0px');
}
});
```

In this case, as our .food section for each year becomes visible, we make three changes to each of the three food items in our bar chart. First, we remove the class .fade-down from it (if it's there). For example, if we were scrolling back up through our infographic, the .fade-down class would be applied to charts we'd already scrolled past. Next the .food1 (or 2 or 3) class is added. This was the class that was associated with our staggered delay fadeUp animations. Lastly, we assign a width to our food item based on the total number wrapped in the to trigger the transition we set earlier. On the flip side, when the .food section is no longer visible, we reverse the class assignment and set the width to 0 so that it's ready to play again should it come back into view. ■

The world of Arduino

Darren Yates explores Arduino, the world's most popular DIY microcontroller system and how to use its integrated development environment (IDE).

Over the last year or so, our Arduino Masterclass has been hugely popular, but if you're not sure what all the fuss is about, here's your chance to get in on the ground floor. Arduino is the world's cheapest and most popular DIY computer system. It allows you to write incredibly efficient software code or 'sketches', program them into the Arduino's flash memory and run in all manner of embedded applications – single- or multi-function situations that don't need the complexity of a PC.

Arduino is the perfect way to combine learning computer programming and how to interact with real world objects like lights, motors and switches. But it's also a great first step into the wider world of electronics design. Through Arduino, you can build everything from automated Twitter clients to robots to complex projects like 3D printers, multi-rotor RC copters and even an Arduino-powered mobile phone.

The two key parts are the Arduino microcontroller board and the

integrated development environment or IDE.

INTRODUCING ARDUINO BOARDS

Since its creation in 2005 by a band of dedicated Italian university lecturers, Arduino has expanded into numerous models, many of which are available at very low cost on eBay. Here are the main ones we'll look at.

ARDUINO CLONES

All Arduino boards (except for the Intel Galileo) are open-source, so you're free to make and sell your own. That means the majority of boards on eBay are clones, but that's fine as we've used many clone boards and they work perfectly well. Why use clone boards? Price – complete pre-built, ready-to-go clone boards start from under around \$8 – and that's including shipping!

ARDUINO SHIELDS

The key to Arduino's success is

undoubtedly its expansion port or 'shield header', which allows you to plug in expansion boards or shields providing extra functions, everything from motor drivers and alphanumeric LCDs to 3D printer power boards and mobile phone modules. There are even blank prototyping shields that allow you to roll your own designs. The key to using shields is ensuring you include any required libraries in your sketch to make them work.

VITAL INGREDIENT: YOUR IMAGINATION

If you have a project in mind or something you want to build, chances are there's an Arduino board that will fit the bill nicely. The only thing you need to add is your imagination. Arduino won't turn you into an electrical engineer overnight, but it's a great way to open the door into the world of electronics, become an engineer and design the products of tomorrow.

What's available

Interested in getting started with Arduino? Here are some of your options.

ARDUINO UNO

PRICE: FROM \$14 (EBAY)

The most recognisable Arduino is the Uno and like most early Arduino boards, it runs Atmel's 8-bit/16MHz microcontroller chip called the ATMEGA328P. It's incredibly modest by PC standards but enough for the vast majority of projects. You get 2KB of RAM, 32KB of flash storage and 20 input/output (I/O) pins (14 digital and six analog) to connect to the real world.

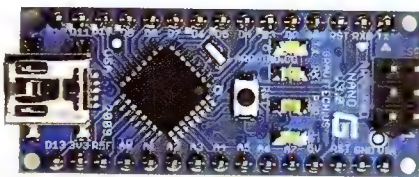


The Arduino Uno, the most well-known Arduino microcontroller board.

ARDUINO NANO

PRICE: FROM \$8 (EBAY)

The Nano is an ultra-compact version of the Uno, with the same chip, built-in USB controller and about the size of a small USB flash drive. It doesn't support expansion boards or shields like the Uno but it has the same electrical characteristics and performance. Well, not quite – it gives you two more analog inputs compared with the Uno. Not bad for such a tiny board.



The Arduino Nano uses the same chip as the Arduino Uno.

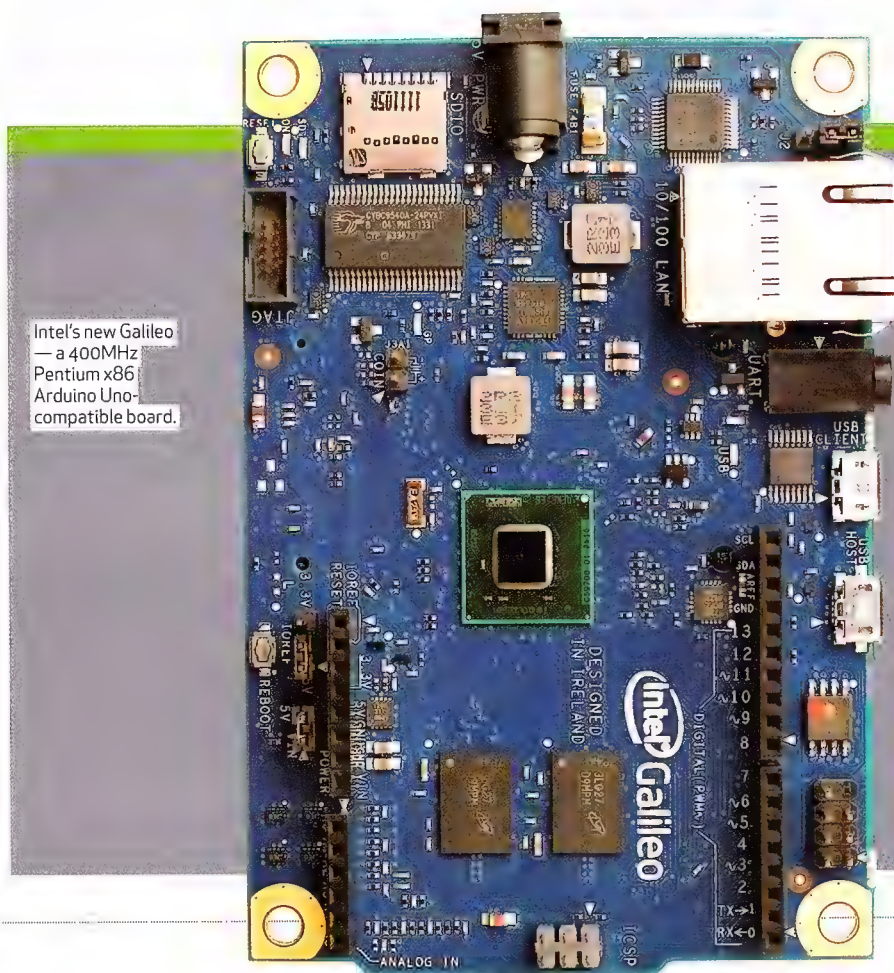
ARDUINO LEONARDO

PRICE: FROM \$10 (EBAY)

The Leonardo is the replacement for the Uno and features a new ATMEGA32U4 microcontroller, which integrates the USB controller into the chip itself, making it cheaper to produce. It has the same basic 16MHz/8-bit performance but features 2.5KB of RAM. Integrating the USB controller means you get more functionality and greater ability to integrate it with PC USB ports.



The Arduino Leonardo offers new USB functionality.



Intel's new Galileo
— a 400MHz
Pentium x86
Arduino Uno-
compatible board.

INTEL GALILEO

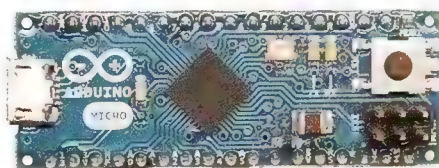
PRICE: EXPECTED TO BE \$50-60

The brand-new Galileo is set to become the most powerful Arduino-compatible board of them all and marks Intel's introduction into the Arduino ecosystem. It is fully compatible with the Arduino Uno, but runs Intel's new Quark X1000 SoC (system on a chip), a 32-bit Pentium-class x86 processor running at 400MHz. It features 512KB of static RAM, 256MB of dynamic RAM and 8MB of on-board flash. But with on-board 10/100 Fast Ethernet, host USB port and a MicroSD card slot, connectivity and storage won't be a problem. Did we mention the PCI Express mini card slot on the back? Best of all, the Galileo is programmed using the same software as standard Arduino boards. Galileo is expected to go on sale at the end of November for a rumoured \$60 or so.

ARDUINO MICRO

PRICE: FROM \$8 (EBAY)

The Micro is the ultra-compact version of the Leonardo, using the same ATMEGA32U4 chip. It's actually smaller than the Arduino Nano and useful for a range of lightweight projects including multi-rotor RC copters. As tiny as it is (the length of a 'AAA' battery), the Micro still gives you 20 I/O pins, including 12 analog inputs. Like the Leonardo, the Micro can simulate a USB keyboard or mouse, thanks to Arduino IDE's keyboard/mouse libraries.

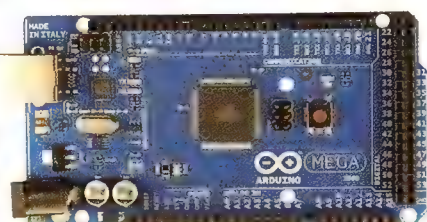


The tiny new Arduino Micro is a miniaturised Leonardo.

ARDUINO MEGA 2560

PRICE: FROM \$17 (EBAY)

The key to the Mega is its digital I/O options. It uses Atmel's ATMEGA2560 controller chip to offer up to 70 I/O pins and is ideal for those complex projects where you need to control multiple devices at once. The Mega is the brains behind many open-source 3D printers (and a few commercial models too). It only has 8KB of RAM and 256KB of flash storage but it's more than enough to create a full-function 3D printer. It's amazing what you don't need when you don't run bloatware...

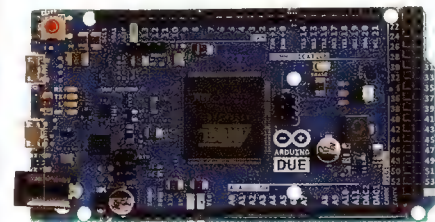


The Arduino Mega with its 70 I/O pins powers many open-source 3D printers.

ARDUINO DUE

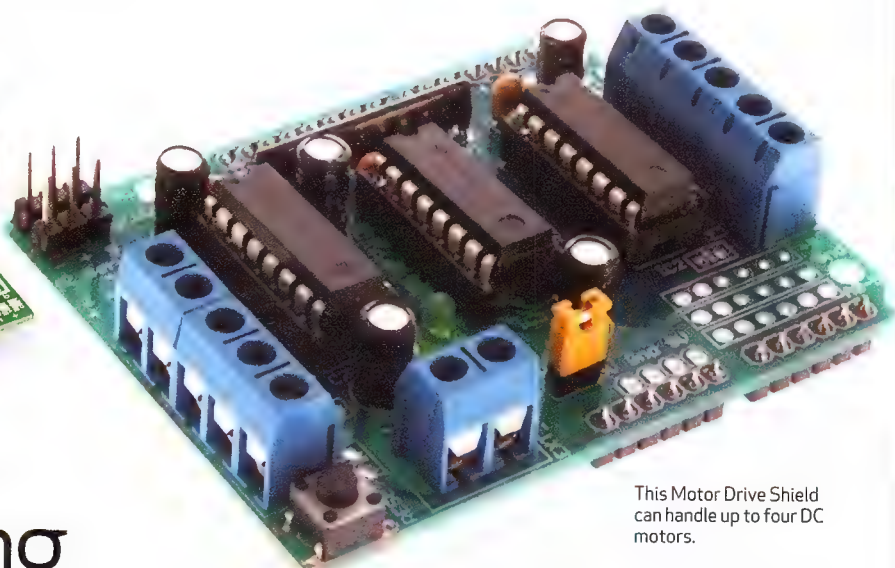
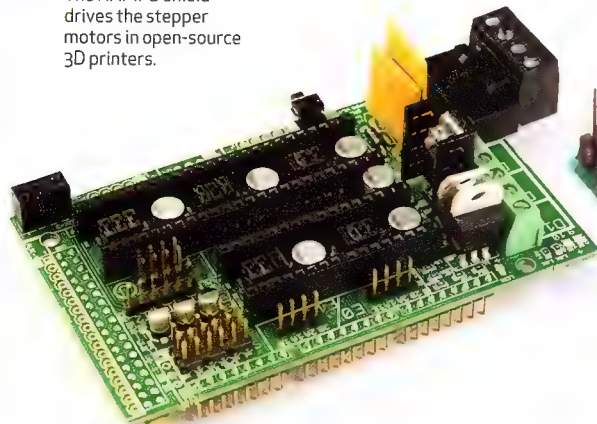
PRICE: FROM \$35 (EBAY)

Introduced in late 2012, the Due is the same size as the Mega but is the first Arduino to use an ARM-class microcontroller. It's based on the ARM Cortex M3 design with 32-bit processing and a clock speed of 84MHz. It features 96KB of RAM and 512KB of flash storage. There are 66 I/O pins (54 digital, 12 analog) and includes two USB ports, one a host port. The Cortex M3 is a basic version of the Cortex A-series chip inside your tablet and smartphone.



The Arduino Due runs an 84MHz ARM Cortex M3 microcontroller.

The RAMPS shield drives the stepper motors in open-source 3D printers.



This Motor Drive Shield can handle up to four DC motors.

Programming Arduino with the IDE

Darren Yates shows you how to connect your Arduino to your PC and program it using the integrated development environment.

If there's one other factor responsible for Arduino's success, it's the programming software, the IDE or integrated development environment. It's easy to use but still powerful with built-in compiler, serial monitor (to get real-time feedback from the Arduino) and excellent debugging capabilities to help remove bugs from your sketch.

You program all Arduino boards using Wiring, an offshoot of the Processing programming language. Think of it as a simplified version of C++. But you can also program in assembly/machine code

for more complex applications where speed is imperative. Programs you create and load into an Arduino board are known as sketches.

INSTALLING THE SOFTWARE

To program an Arduino board, you need the Arduino IDE and you can download it from arduino.cc/en/Main/Software. There are two versions – the stable mainstream version for all 8-bit Arduino boards (v1.0.5) and the newer beta version (v1.5.4) with included support for 32-bit boards like the Arduino Due and the new Intel Galileo.

The software is available for Windows (XP or newer), Linux and Mac OS X, so no matter your poison, there's an option for you. For this guide, we'll be using Windows.

CONNECTING TO THE PC

All of the Arduino boards we've looked at connect to your PC via a standard USB port. The board may have a common type-B, miniUSB or microUSB port and may or may not include the cable. However, any appropriate cable you have can usually be substituted.

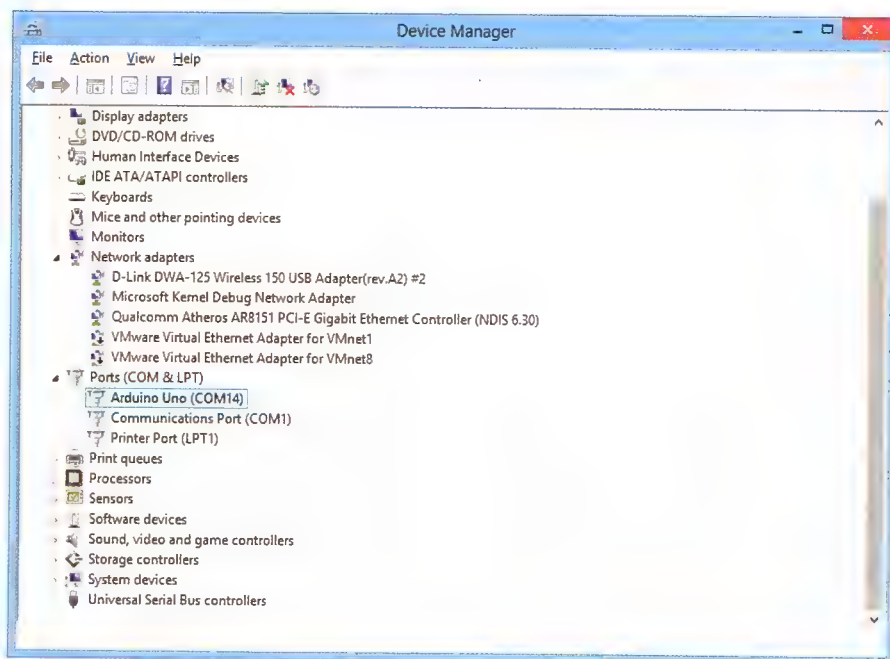
Once connected (and your PC is up and running), Windows should begin searching out the driver software, but success can be dependent on your version of Windows and Arduino board.

The latest Arduino IDE (v1.0.5) now includes signed drivers for Windows 8 (including 64-bit version) and should install automatically. If the driver doesn't install, you can load it manually by pointing your Windows version to the Arduino IDE's drivers folder. Fire up 'Control Panel', launch the 'Device Manager' and come down the list until you get to Ports (COM & LPT). Expand the list and you should see an entry for your Arduino board. Note the number of the COM port it's connected to (in our example, it's COM14). You'll need this in a moment.

The driver is an all-in-one release so should work for systems right back to Windows XP.

CONNECTING TO THE ARDUINO IDE

Once that's done, you can now fire up the Arduino IDE. On the surface, it's



The Device Manager will show you the COM port used by your Arduino board.

quite 'minimalist', but much of it is hidden until you need it. Here's a quick tour – the menu at the top gives you all of the controls you'll need, with the shortcut bar just underneath. The main white area is your sketch window – the IDE supports tabs so you can view multiple files attached to your sketch project at the same time. The black bar at the bottom is the debug window – any errors in your sketch when it is compiled will appear here. On the top right, you'll find a magnifying glass icon – that's not search but rather the Serial Monitor, which allows you to provide data feedback to the IDE, a kind of real-world monitoring. However, your sketch must direct data to the monitor using the Serial command for it to work.

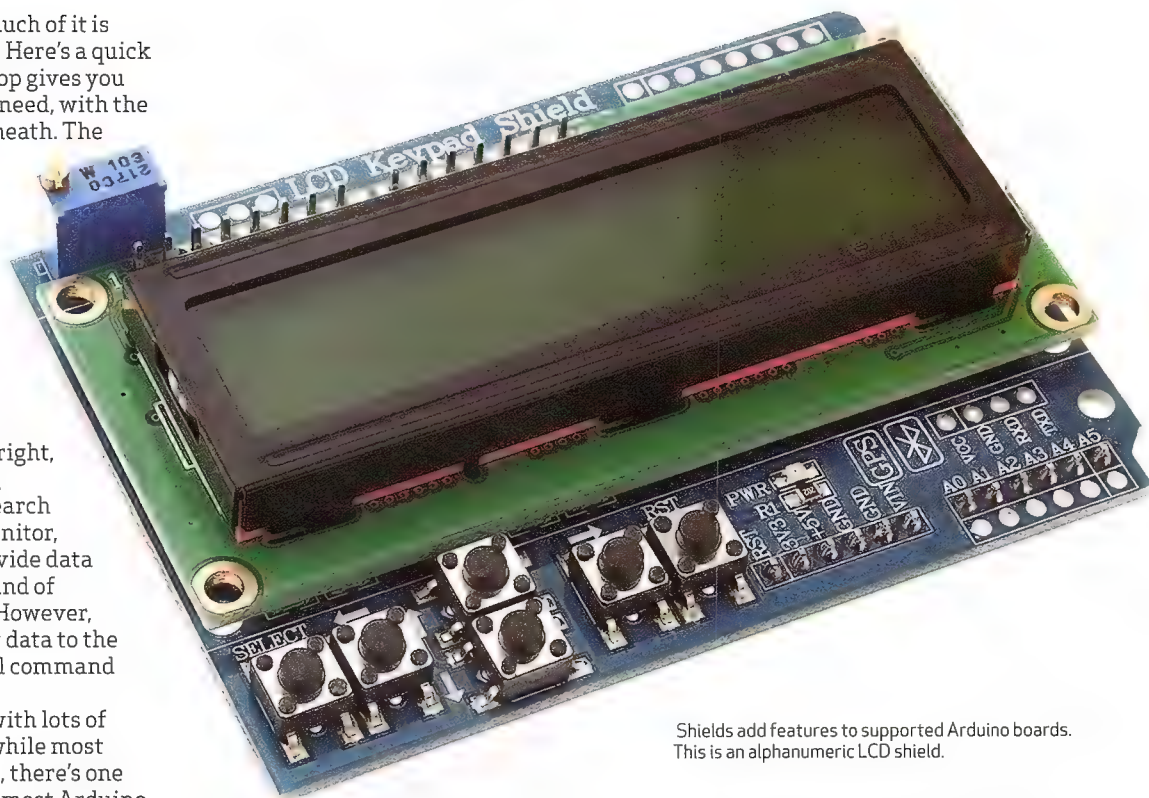
The software comes with lots of example sketches and while most require extra hardware, there's one you can load and run on most Arduino boards alone called Blink.

You find it by selecting 'File > Examples > 01. Basics > Blink'. The file will load in a new window, which you can maximise. The sketch is quite simple – it flashes on and off the built-in LED on the Arduino board.

The next thing you'll want to do is ensure the IDE is set to use the correct COM port and the correct Arduino board setup. So, from the main menu, select 'Tools > Board' and choose your Arduino board type from the list. Next, select 'Tools > Serial Port' and tick the COM port you noted earlier.

COMPILING YOUR FIRST SKETCH

Underneath the IDE's main menu, you've got that row of shortcut icons.



Shields add features to supported Arduino boards. This is an alphanumeric LCD shield.

The tick icon is the compile test or verify. This compiles your sketch code without uploading it to the Arduino and lets you know of any problems, even to the extent of what the problems are and which code line(s) they're on. If you've loaded the Blink example, click the Verify icon and it should compile without error. You'll see the results in the debug window, including how much storage it'll need and the total amount available. Congratulations – you've just compiled your first Arduino sketch.

Now if you've connected your Arduino board, selected the board and COM port in the IDE and verified your sketch is bug-free, you can now compile and upload it to your Arduino. You do that by pressing the 'right arrow' icon.

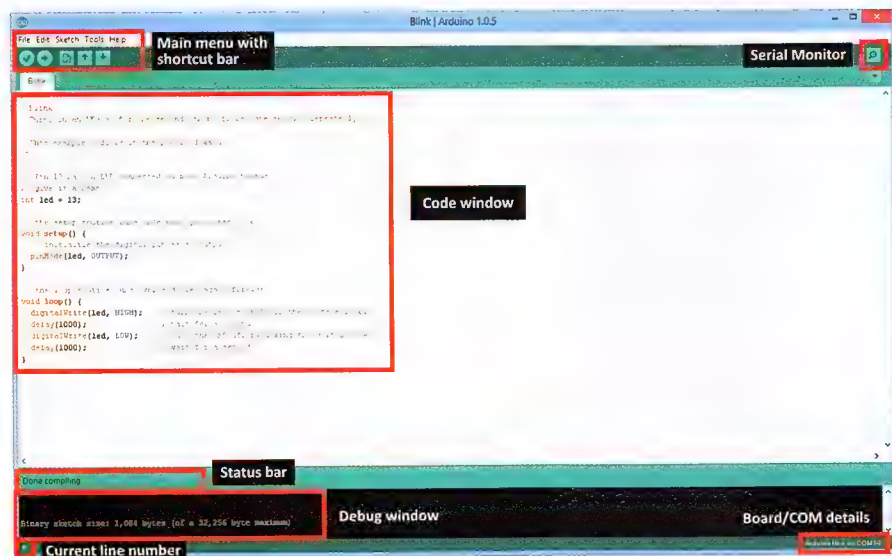
After compilation, the IDE uploads the sketch to your Arduino's internal flash storage. You should even see the TX/RX (transmit/receive) LEDs on the board flash during the process. When completed, the IDE status bar will indicate this and your Arduino will automatically launch the sketch code. Within a second or so, you should see the LED blinking on and off.

YOU'RE ON YOUR WAY

Now you're ready to explore the Arduino world. If you're not sure what to do next, try modifying the blink sketch – change the number in the 'delay(1000)' lines to see what happens. Any text appearing on a line after '//' is comment text and not actual code. Arduino doesn't use the full gamut of C++ commands, but you can find the command reference manual over at arduino.cc/en/Reference/HomePage and there's a more detailed starter's guide available at arduino.cc/en/Guide/HomePage.

But that's just the start. Once you become more familiar with the programming language, you can grow your designs with purpose-built shields or even just interconnect with your own devices – lights, switches, motors and more. And beyond that, you can expand into the world of electronics and learn about transistors, integrated circuits, diodes and the rest. If you want to learn how computers interact with the real world, Arduino is a great place to start.

We'll get back to building Arduino projects next month. See you then. ■



The Arduino IDE is where you program your sketches and upload them to Arduino.

Making your own ROMs

PART 5

Darren Yates concludes his series on how to customise your own Android ROMs using the Android Kitchen app.

If you've been following this Masterclass from the beginning, you should now be able to set up the Android Kitchen app, take a stock ROM for your supported device, load it up, rip out the bloatware, change the splash screen and even add in your own performance-enhancing scripts. This month, we go deeper into our Android ROM by looking at the boot image – what it does, how to pull it apart, modify it and put it back together – before we build our final ROM package and flash it to our device.

WHAT IS THE BOOT IMAGE?

We looked at the concept of a boot image briefly last month in considering initialization (init.d) scripting, but it's time to look at it in more detail. When your phone or tablet boots up, the Android OS you recognise is in effect the second OS it launches. Before that, your device uses a tiny app called a bootloader to load the boot image, which contains the kernel and the initial root file system (initramfs) or RAM disk.

This boot image has one specific job – to lay the component platform on which the main Android OS is launched.

It's a bit like the BIOS of your PC, except that instead of residing in an EEPROM on a motherboard, the boot image is supplied with the Android ROM.

However, the boot image exists in the ROM as a single file – effectively, it's a ROM within a ROM.

It's the first thing your Android device loads when it boots, but it has one other important function relevant to this Masterclass series – it's also the source of your root access.

WARNING

Flashing your Android device with any ROM is a risky business. While we have our quality control in place, we cannot be held responsible for any damage to your device or data loss that may occur.

PULLING APART BOOT.IMG

Because it is a ROM within a ROM, we need to pull it apart before we can see what it does and modify its features. Thankfully, the Android Kitchen provides us with the tools to do this. We're assuming you've been following the series, you've already set up the Android Kitchen app on your Linux PC or virtual machine and you have an Android ROM already expanded. The next step is to pull apart the boot.img file and you do that within the Kitchen by selecting '0 – Advanced Options', followed by '12 – Tools for boot image'.

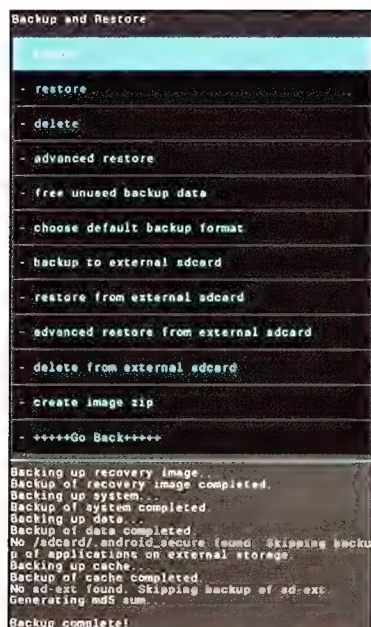
This brings up the 'Boot Image Tools' menu. Just to make sure your ROM is valid and has a boot image on-board, the first thing you should do is select S to show the boot.img file information.

```
default.prop - Mousepad
File Edit View Text Document Navigation Help

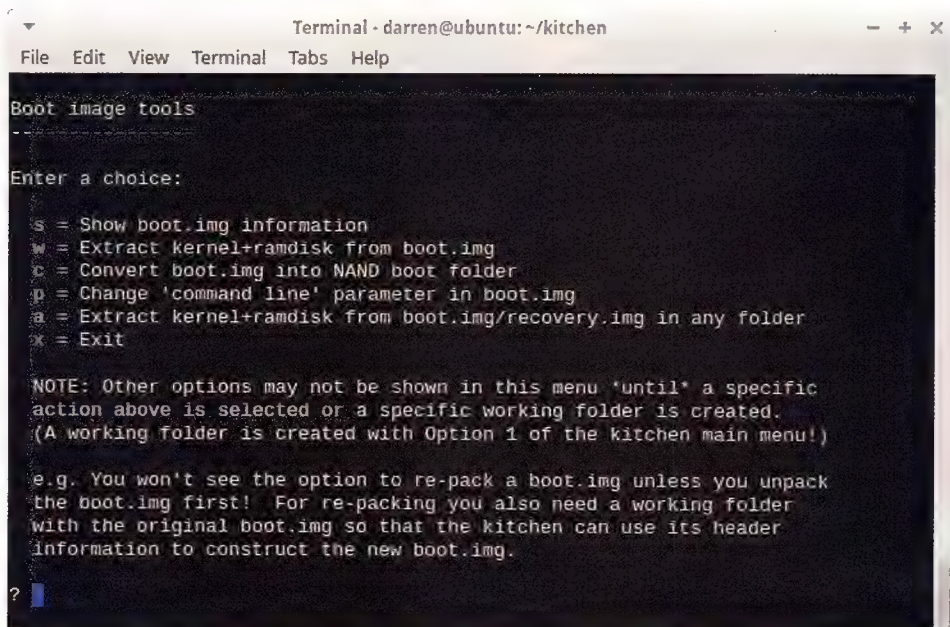
#
# ADDITIONAL_DEFAULT_PROPERTIES
#
ro.secure=0
ro.allow.mock.location=0
ro.debuggable=1
persist.sys.usb.config=mtp,adb
```

Set 'ro.secure=0' in the boot.img's default.prop file to gain root access.

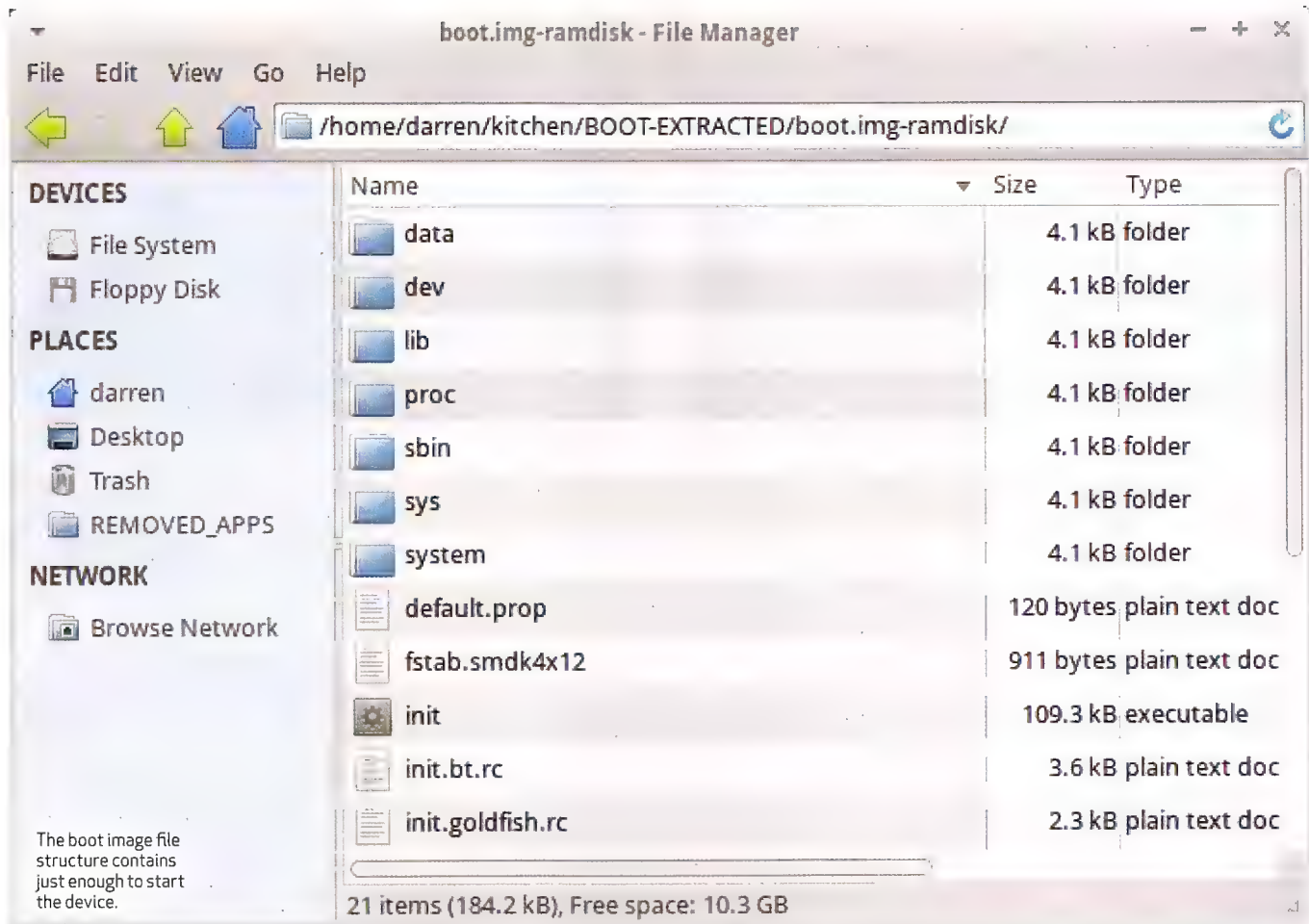
Filetype: None Line: 1 Column: 0



Make sure you backup your Android device before you flash a new ROM.



Press 'W' to extract the RAM disk from the ROM's boot.img boot image file.



After that, choose W to pull the boot.img file apart – the Kitchen will extract the kernel and the RAM disk into a subfolder called BOOT-EXTRACTED in your /user/kitchen folder location.

MANUALLY ADD ROOT ACCESS

Now you can use Thunar, Nautilus or your favourite Linux file manager to look inside this folder and you'll see a 'zImage' file (the Android kernel) and 'boot.img-ramdisk' folder (the boot image). Again, we're using a stock Android 4.1.2 ROM for a Samsung Galaxy S3 smartphone in this example – your mileage may vary, but it shouldn't be by much. If you look inside the boot.img-ramdisk folder, you'll see what vaguely resembles the folder structure of a Linux OS, which is roughly what this little RAM disk is.

One of the first files you should see in this folder is default.prop, a properties file that tells the device some basic setup options, including its security setting. Now the first thing we'd suggest here is that you make a copy of this file and store it somewhere outside the Kitchen folder as a backup. After that, you're safe to work on the real file in your working folder.

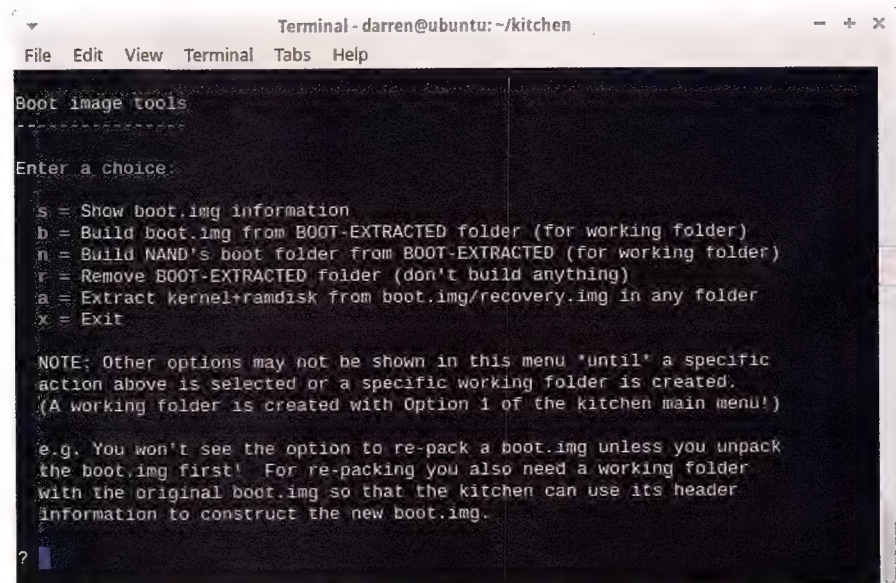
Open up the file in a Notepad-like text editor (Mousepad is my favourite) and you'll see the line 'ro.secure=1' or 'ro.secure=0'. If the ro.secure key is set to

'1', it means your Android OS is in secure mode and won't allow root access. But if it's set to '0', you'll now have root access. And essentially, that's it – that's what all the root-access fuss is about. This is what Android Kitchen's 'Add root permissions' option (and every other root-access app) has to do to enable root access – open up the boot.img RAM disk and edit default.prop to read (among

other things) 'ro.secure=0'.

That said, Google appears to have changed how security works in Android 4.3 and getting root access on a 'live' device running this OS has been problematic. While our process will work with ROMs up to Android 4.2.x, we'll need to investigate Android 4.3 support further.

In the meantime, here's the complete



The Boot Image Tools menu changes when you're ready to rebuild the image.


```
Terminal - darren@ubuntu: ~/kitchen
File Edit View Terminal Tabs Help
update-script already has permissions set for init.d folder

Select a build option:
1 = Interactive Mode - recommended for most users
  (Guide me through the build)
2 = Lazy Mode - trust the kitchen to do everything without asking
  (Zipalign, Edify, sign ROM, auto-name ZIP)
3 = Express Mode - for advanced users
  (Zipalign, Edify, don't sign ROM, auto-name ZIP)
4 = Extreme Mode - for advanced users
  (No zipalign, no script conversion, don't sign ROM, auto-name ZIP)
5 = Cancel - Don't build now

Number (default: 1):
```

There are four options to build your ROM — choose the interactive mode first time.

```
Terminal - darren@ubuntu: ~/kitchen
File Edit View Terminal Tabs Help
Copying update-binary
.../tools/update_files/sigs3-update-binary? update-binary?

An updater-script has been created under META-INF/com/google/android of
your working folder. Please review it and make any necessary changes. An
update-binary has also been added.

DO NOT delete any of the files under META-INF/com/google/android.

Proceed with the change (y/n)?
y = Proceed; updater-script and update-binary will be used in the ZIP
  file; update-script will remain in working folder.
n = Cancel; updater-script and update-binary will be deleted and not
  used.
? (default: y):

Making update.zip
```

Creating the ROM in the update.zip file is cause for a cuppa!

default.prop file for our customised root-access-enabled Galaxy S3 test ROM:

```
ro.secure=0
ro.allow.mock.location=0
ro.debuggable=1
persist.sys.usb.
config=mtp,adb
```

MTP OR UMS?

The last line has nothing to do with root-access, but sets the default USB configuration setup — whether it uses the Media Transfer Protocol (MTP) or USB Mass Storage (UMS) device driver method when connecting to your PC.

For MTP, you'll see 'persist.sys.usb.config=mtp,adb' and for mass storage, it'll be 'persist.sys.usb.config=mass_storage,adb'. In practice, your phone/tablet will appear as a media device in Windows Explorer if you use MTP, but via UMS, you'll see it as a normal external drive. UMS stops your device doing anything else while files are being transferred, plus there's a 4GB filesize limit. MTP on the other hand allows your phone to still do other things and there's no filesize limitation, but it does

support Windows DRM. Incidentally, 'adb' refers to Android Debug Bridge, a way of programming your Android device through a direct USB-connect to your PC.

REBUILDING BOOT.IMG

Once you've made any changes, you have to rebuild the boot.img file before it can be bundled back into the ROM. You do that by going back to Android Kitchen's Boot Image Tools menu where you'll now find a 'B = build boot.img from BOOT-EXTRACTED folder'. Select B and it'll not only rebuild the boot.img file but copy it back to your working ROM folder and delete the BOOT-EXTRACTED folder, tidying everything up. (It's not a great idea to have multiple boot image folders floating in your working folder.)

CHANGE THE ROM NAME

The last thing to do before you build your custom ROM from this mad collection of folders and files is to set your ROM name. Every Android ROM has a name that's displayed in the 'Settings > About Device' page and you should give yours a unique name.

To do that, go to Android Kitchen's main menu and select '7 - Change name of ROM'. This will show you the existing name and allow you the choice of renaming it. We recommend you keep any existing base name codes and just add your own custom text to it. This way, you'll easily identify its original source at a future date.

FINAL CUSTOM ROM BUILD

Now you're ready to build your final customised ROM. At this point, it's worth making sure, again, that you've been using a ROM base that's designed for your particular device. Flashing a ROM that's not designed for your device is a guaranteed way to brick it, so it really does pay to be sure before you do it.

To put your files back together again into a flashable ROM, go to Android Kitchen's main menu and select '99 - Build ROM from working folder'. The Kitchen gives you four build options — Interactive, Lazy, Express and Extreme. We recommend everyone runs through the step-by-step Interactive option at least once, just so you know what the Kitchen is doing and to understand what's involved in the process. After that, choose the Lazy option as the fastest way to get you home. But regardless of which option you choose, there's a fair bit to do here so be prepared for it to take some time — enough to get a cuppa, depending on the size of your ROM. When it's finished, you'll find the new ROM as a single zip file in the OUTPUT_ZIP folder in your main Kitchen folder.

FLASHING YOUR CUSTOM ROM

Once you have your custom ROM, flashing it to your device is just the same as flashing any other ROM, whether it's a stock ROM, CyanogenMod or whatever. We don't have space to cover the whole process now, but we did go into detail of how to gain root access and flash a custom ROM using Samsung's Galaxy S2 and S3 smartphones as examples back in the May 2013 issue of APC. You'll find

```
Terminal - darren@ubuntu: ~/kitchen
File Edit View Terminal Tabs Help

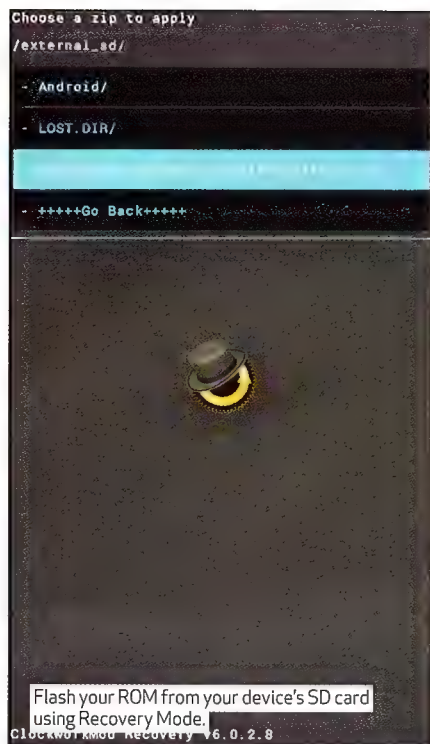
Congratulations ... your ROM is here:
----> OUTPUT_ZIP/m0_signed_APC_Dec2013_101413_044037.zip

Copy this to your device and flash from custom recovery menu.

NOTE 1: Remember to do a factory reset or data/cache wipe if necessary!
NOTE 2: Always refer to the Android Kitchen FAQ @ xda-developers.com for
common issues such as:
- Errors during flashing (e.g. Status 0)
- Non-booting ROM after flashing ZIP file

Good luck!

Press Enter to continue
```

this story online at apcmag.com/how-to-root-your-android-phone.htm.

In short, the process here is:

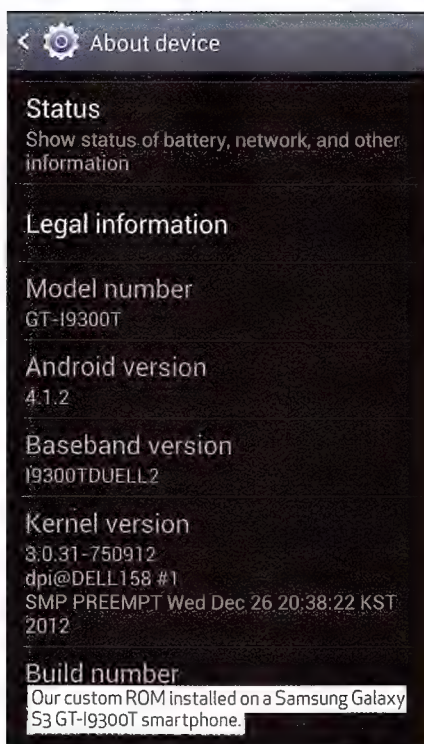
- Backup your device
- Root your device, adding a custom recovery app like ClockworkMod
- Copy the new ROM zip file to the device's SD card slot
- Boot into Recovery Mode (usually the power, home and volume-up buttons)
- Wipe Dalvic Cache
- Install new ROM
- Reboot

Again, it's important that you're using a ROM base that's designed for your device and to follow the root access and ROM flashing process that works with your device.

While rooting and flashing custom ROMs to Android devices are now everyday occurrences, we can't guarantee the process will work flawlessly every time. It should – we just can't guarantee it. That's why it's important you understand the troubleshooting options for your device's recommended process before you starting flashing, just so you know what to do should trouble strike.

TROUBLESHOOTING

As far as your new custom ROM goes, provided you've followed the steps for your device correctly, you should end up with a working ROM, but it'll still be subject to all the usual install issues when installing any Android ROM. The two most common problems we've seen are boot lockup, where you see nothing but your splash screen; or a boot loop, which sees your phone cycling through your boot animation and rebooting again and again.



But before you hit the panic button, thinking you have a boot lockup, be patient – the first boot of a new ROM will always take extra time and subsequent boots will quickly sort themselves out. But if your device hasn't booted up within ten minutes, it's pretty safe to assume there's a problem somewhere.

If your device appears stuck in a boot loop, the most common issue is forgetting to wipe the Dalvic cache partition – basically, your device is trying to use cached data from your old ROM with the new one and it's (not surprisingly) failing. Go back to 'Recovery Mode', wipe the cache and it should now work. If necessary, you may

need to re-flash the new ROM too.

If the device is locked up on the splash screen, you may have the same problem but it's also possible that your ROM just isn't right. You must make sure you're using the correct ROM base for your device. Try building the ROM again from your working folder, check for any possible errors and flash your device again. If you still can't get your device to boot, don't panic – flash it back to original with the stock ROM again, in which case, you may need to start your build process again from scratch.

Other things to consider are any apps you have removed from the ROM. It's easy to get a bit enthusiastic about removing bloatware apps and go a step too far – always only remove apps you know and know are bloatware only.

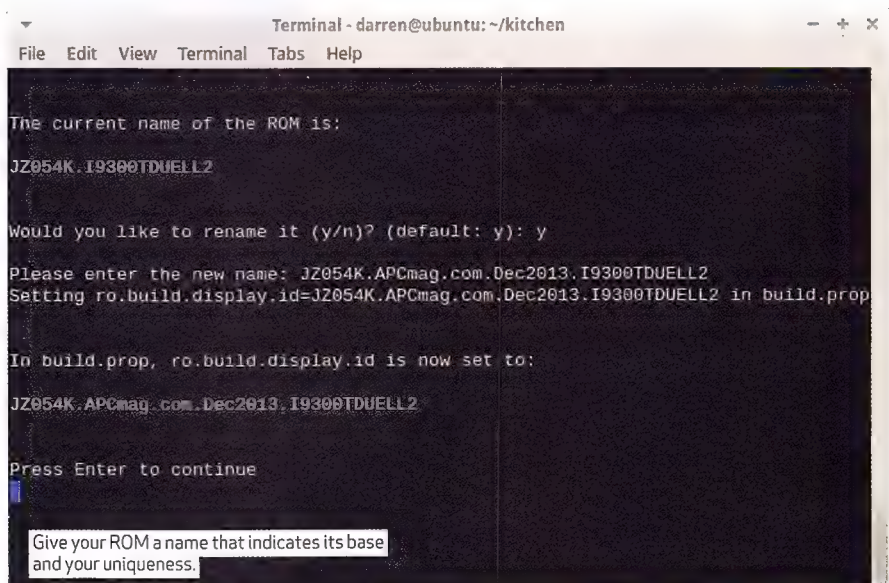
ALWAYS BACKUP BEFORE YOU FLASH

But if there's one over-riding thing to remember, it's always make a Nandroid Backup of your phone/tablet before you flash any ROM, so that if things go seriously wrong, you can always restore your phone to its current state. We cannot emphasise this enough.

And make sure you copy the backup to your PC or home server for safe keeping. Don't just store it on your device's storage card – it's far too easy to erase it.

NEXT MONTH

Hopefully, this series has given you a taste for how Android ROMs work and that they aren't really as scary as they may first look. Starting next month, we'll begin taking some of the things we've learned throughout this series and applying them 'live' to your device's existing Android OS. We'll start by how to bypass a Google Play app's unsupported devices list and get it installed on any Android device. We'll see you then. ☺





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FIFA 14

Doubts over champion's title hopes prove unfounded.

The trouble with iterative sports games is that, year on year, you rarely feel like you're truly getting a new experience on first play. Familiarity breeds contempt. However *FIFA 14* feel like a new game, in the very best way possible. Happily, this isn't down to one big gimmick, but EA Canada refining and improving upon every fundamental of football.

Shooting is tied directly to player animation and therefore more natural, so a perfectly timed volley both looks and feels like one. Momentum takes into account the speed and angle at which a player is moving, enabling you to beat opponents with a well-timed turn of pace rather than a ballet-worthy trick. Defending is less risk-reward. Team-mates make clever forward runs and track opposition players properly. Central midfielders get more time on the ball. Keepers are better. The best part is how you swiftly stop noticing these upgrades and just become attuned to the smooth, fluid football *FIFA* serves up – never finding yourself bemoaning the AI's

superhuman ball retention skills (gone!) or Messiesque ability to score in every match (gone!). On receiving the game, I lost six hours to one more match it is before even considering Seasons, Ultimate Team, or Career. It's that moreish. Which isn't to say those modes don't swiftly develop into huge timesinks once you dabble in them. At time of writing Seasons and Ultimate Team are tough to test given that there's no one to play online, but Career mode has undergone as spectacular an overhaul as the on-pitch action: new scouting system, new menus, new ways to tailor it to your liking (for instance, swapping teams between leagues before you start, or switching off the first transfer window to keep real-life squads intact. Nice). The scouting network feels more akin to *Football Manager* than *FIFA* – and for the better. Instead of searching for potential signings using attributes, you task scouts (six maximum) to find players with specific traits: eg, 'centre back, tall, defensive-minded' or 'centre forward, prolific, first-team ready'. Once they've found targets who match those

descriptions, you see a range of attributes pertaining to each, such as 'Pace 68-78' – but need to scout further for those ranges to narrow. You can still search by name, club, or league, but unless listed for transfer or loan, you only initially see a player's age and position. Again, scouting is key. The idea is that Career offers something deeper than just matches, and it's a sound one, with results that suit your club: as Celtic in the Championship (remember what I said about swapping leagues?) I was presented with CB options such as David Wheater and Ron Vlaar, whereas my time as Exeter boss threw up cloggers from Scotland and Germany who I'd never heard of. These Career changes amount to a giant step forward for *FIFA*, as is the case elsewhere. Gameplay is the best it's been on PS3, and presentation is improved, too.

■ Ben Wilson

Verdict

With the PS4 version set for a Bale-style arrival in November, expectations were low on PS3 – but *FIFA 14* is brilliant.



Memoria

THE DARK EYE BLINKS AGAIN

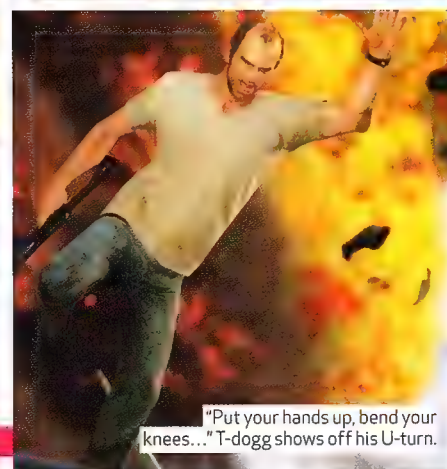
US\$20 | PC VIA STEAM | WWW.MEMORIA.DAEDALIC.DE

Daedalic has a way to go to reach the heights of a Sierra or LucasArts, but *Memoria* is a great example of why the name is valued by adventure gamers. Other games have bigger budgets and ambitions, but in terms of artistry few get close to this German gem. *Memoria* is the sequel to 2008's impressive *Odyssey* (a mix of science and fantasy) and is a beautiful world waiting to be discovered.

Playing the first game isn't essential, but *Memoria* doesn't do a great job of reintroducing one half of the adventure. *Odyssey*'s tale, the story of a young hero hunting for a way to turn his fairy lover from a fever back into a real girl. The other half is a new, and much more pragmatic princess, Sadia, willing to do anything to become a legend. Even teaming up with a potentially demonic and definitely smoky spirit trapped in a magic staff. What is less than a good thing is a subtle, if the big question being asked at all, wants to be answered. Both *Odyssey* and *Memoria* are a glorious looking surface with standard, a little bit of a mess. The puzzles are linear and logical, there's little scope for wandering, and both characters are loaded up with magic that never quite gets enough use. *Odyssey*'s *Destiny* (repair power, by the way) should be a more interesting mechanic, but in *Memoria* it's a little more useful. *Memoria* is a great example of one of the old school, but an absorbing example of one of the new school. ■ Richard Cobbett

Trevor will do anything to protect his meth empire. Just like Walter White.

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Grand Theft Auto V

Three men and an LA deed sign the generation off in style.

From resolving global conflicts to slowly battling a little white blob back and forth (how often do you actually do that in real life?), all videogames exist as a form of escapism. But those that offer it most overtly aren't actually the ones that allow us to save the world single-handedly or let us control a cartload of chimpanzees with our mind (which, incidentally, sounds awesome). It's those that offer a rough simulacrum of reality and provide us with the freedom to interact with it as we wish that are the most compelling virtual holidays.

That's always been one of the key appeals of *GTA*: regular guy makes good in (semi) regular world. And OK, he may make good in the most violent and psychopathic way possible, but no amount of squashed pedestrians can run over the games' aspirational nature. And it is here that *V*'s greatest triumph lies. The scathing social commentary is, of course, present and correct. Likewise the eccentric cast of misfits and oddballs we've come to expect. And, now far more than ever, the ambitious, cinematic

missions involving all kinds of spectacular carnage. But standing above all of this is the fact that no other virtual world in all of gaming is as fully realised and alluring as what's on offer here. This is a glorious and jubilant reminder of the fact that — at their heart — games are supposed to be about having fun, and few, if any, experiences during this entire console generation provide as much pure joy. Such is the frequency with which remarkable moments occur that no longer can they be called highlights: the game's standard operating mode is to have your mouth agape in amazement. Backflipping a motorbike over an airport terminal. Parachuting out of a cargo helicopter into a fully manned military base. Causing a 20-car pile-up on a freeway during rush hour by sniping a truck driver from half a mile away. Oh, and the stuff you're tasked with during missions isn't too shoddy, either.

SUN, SEA, AND SANDBOX

The scale and sense of freedom is so staggering that the initial wave of amazement

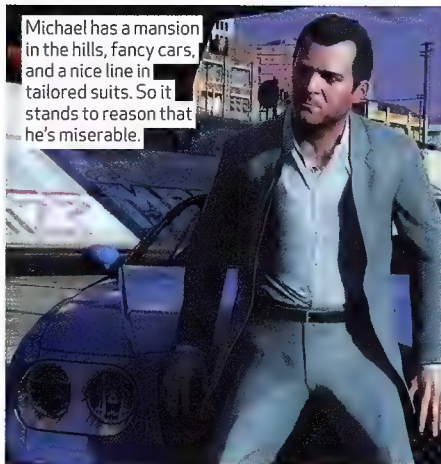
never wears off — every now and then you're hit with a whole new sense of 'wow' as you realise just how much is on offer to you at any one moment. This is not only the biggest world in *Grand Theft Auto* history, incorporating both the city of Los Santos and the sprawling countryside of Blaine County to the north, it's also by far the most richly populated when it comes to activities, asides, and locations just begging to be explored. So luxurious is the level of design that vast structures that would be the environmental highlights of entire games are included without any overt purpose beyond enhancing the sense that this is a real place.

Five years of technological improvements mean that things look far prettier, and allow the world to be both more detailed and more populated. Where once city streets were deserted like a Toni Pearen comeback gig, now they hum with whiny software developers, irate mortgage brokers and disillusioned actresses rushing to casting calls. Certain roads get busier at certain times of the day; sun seekers flock to the beaches

when ol' shiny gets his hat on, and scarper for cover as the rain sets in (there's a fully dynamic weather system); and squabbling foursomes fill the local golf course. Other crimes — some resulting in truly spectacular police chases — are undertaken by the city's more nefarious inhabitants; couples argue in the street; there are boat races, street races, bike races. There has never been a more convincing world in the whole history of gaming.

THREE SLEAZY PIECES

But while the environment is undoubtedly the star, it is more than ably supported by three protagonists, every one of which puts all of the series' previous leads to shame. There's Michael, the monied middle-aged misery who's having a serious life crisis. Franklin, the up and coming street hustler looking to graduate from repo work and gang crime. And then there's Trevor, the psychotic trailer trash dweller who defies classification as much as he does convention. But such summaries fail to do justice to any one of them, and each



Michael has a mansion in the hills, fancy cars, and a nice line in tailored suits. So it stands to reason that he's miserable.



Dirt bikes are among the most versatile vehicles in the game.



Don't pack the Coldplay album by mistake when skydiving.



Catch your son before he falls out of your stolen yacht.



There are 50 stunt jumps to complete. Or die attempting.

showcases their three dimensionality far quicker than should be possible. If you think you've already picked a favourite or that one looks like a weak link then be prepared to reconsider: each of the trio is far more interesting and nuanced than expected. To venture into the details of their backstories or the circumstances of their meeting would be to stumble into Spoilerville (and this itself is a process that's far more rewarding than anticipated), but evidently the specifics of their criminal ambitions bring the three together. And it's when they do converge that *GTA V* spreads its gameplay wings and showcases how the ambition of its mission structure can match that of its world building. Naturally each member of the gang has a vast number of their own objectives, but it's the collaborative heist efforts that are the headliners.

These multipartite undertakings involve planning, recon, decision-making, crewhiring and, ultimately, execution. Payoffs are big, but only in accordance with how smoothly all of these steps go — and there's always more than one way to get your hands on the loot. There are around half a dozen of these high-profile jobs, and each is totally different from the last in terms of motivation, setting and mechanics. While there

could be more variation provided in the choice of approaches you're offered for each — it pretty much comes down to 'sneaky' versus 'loud' — there's precious little repetition in terms of content, and all are truly memorable.

PLANE CRAZY

Not that standout gameplay moments are confined to these. Far from it, as *GTA V* is consistently brilliant in terms of the quality of both its main missions and its side-quests — and to an extent never before seen in an open-world game. Again, to go into too much detail would be to sour the joy of discovery, but brief highlights include riding atop a moving train on a motorbike, driving an ATV out the back of a cargo plane, and landing one plane inside another. And it's a case of quality and quantity, with 69 main missions, a huge range of emergent events, and dozens of Strangers & Freaks side-quests, which really do live up to their name. All of these, heists aside, are specific to each character, bringing the switching dynamic into play. At almost all points (not mid-mission or if you've got the fuzz on your tail) you take control of any of the three, whatever they might be up to at that time. And what they might be up to varies a fair amount, from Michael having a nice refreshing cup of Bean

Machine coffee (the brown stuff is almost as depressingly ever-present as it is in real life), to Franklin taking his Rottweiler for a relaxing walk in the Vinewood hills, to Trevor, um, strangling a biker and throwing him into the sea. It's testament to just how much brilliance there is in *GTA V* that discussing the revamped gameplay mechanics is this low on the priority list in terms of points of discussion. Because they really are excellent. Driving feels less like trying to steer a bendy bus across an ice rink than before, with cars more responsive while still maintaining a degree of realism and, crucially, all feeling pleasingly distinct. Shooting has been massively improved too, bearing more than a passing resemblance to *Max Payne 3* (although it's not quite as solid or rewarding). Weapons (now customisable) are chosen from a handy radial menu, and most pack a hefty punch, with enemies dropping plausibly quickly, especially if heads are being shot.

FUNNY HOW

Everything in the game is tied together with that trademark Rockstar sense of humour, poking fun at everything from the sub-prime mortgage crisis to online trolling to the modern obsession with coconut water. Our characters chase wealth, but also acceptance and a sense

of contentment that they know the money can't bring. Despite all this praise, the game is not perfect: there's a slight sag in the middle section, and one mission in particular is deeply uncomfortable despite the overriding message behind it (sounds cryptic, but it'll be clear enough). But honestly, that's about it. And I haven't even mentioned the car customisation, the property purchasing, the stock market, or the huge range of pastimes such as tennis, stunt jumps, yoga and hunting. There's more content to discuss than it would be possible to mention in a review twice this long, but that's sort of the point.

But is it the finest game of the generation? It depends on your perspective. It doesn't have the storytelling chops of something from the *Bioshock* stable, the emotional resonance of *The Last Of Us*, or the artistry of *Red Dead Redemption's* ending. But there's simply more here than in any game before, and yet quality is never sacrificed for quantity.

■ Joel Gregory

Verdict

Consistently hilarious, constantly compelling and combining never-before-seen scale and ambition.





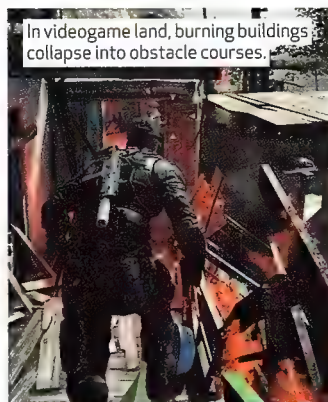
Hammerwatch

A DUNGEON CRAWLER THAT'S BUILT FOR CO-OP

US\$10 | PC VIA STEAM |
TINYURL.COM/KGOUNE9

If you've ever found yourself in a cave even with nothing for it, you'll love this. Hammerwatch is a co-op dungeon crawler that's built for co-op. It's a top-down Diablo for up to four players, stripped of every bell, whistle and other musical instrument. As you might guess, of the four classes — Paladin, Wizard, Monk and Ranger — only the first does battle in melee range. Everyone starts with a class of attack and a skill appropriate to their class. You may also have a companion, a pet, and the local shopkeepers that you'll be able to trade and your repertoire of abilities and increase the likelihood of surviving the next sequence. Hammerwatch is built around these self-contained challenges. Where other games might gesture at telling a story, it merely shrugs. The castle bridge has fallen, there's no way out, proceed or not. Given this lack, it's fortunate that it's so good at being a dungeon crawler. Secret passages and (hordes of various) complexity abound, as does a plentiful number of difficult, tricky enemies. The game moves forward in such fast numbers that it's possible to misplace anything for a bullet hell shooter. My only real beef? The lack of people to play with. Unless you have a cadre of friends willing to take the game on with you, chances are you're going to be left looking up at the screen by yourself in the quiet hours of darkness. It's great to have a dungeon crawler game that is so beginning, but it's not quite the beginning.

■ Cassandra Khan



In videogame land, burning buildings collapse into obstacle courses.



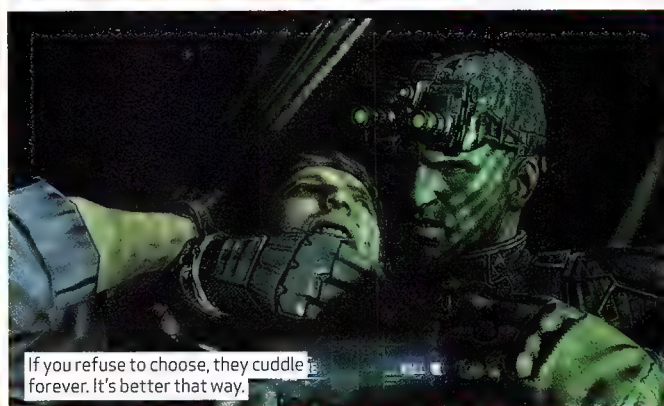
Sam Fisher: secret agent, loving father, b-boy.



That woman could not be less bothered about this turn of events.



Mark-and-execute makes for efficient takedowns.



If you refuse to choose, they cuddle forever. It's better that way.

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Splinter Cell: Blacklist

Sam Fisher stumbles about in the dark.

Splinter Cell: Blacklist is a stealth game of the robust, rule-based kind, where each environment is a puzzle waiting to be cracked. You slip snake cameras under doors or use sonar to get the lay of the land, then pick a route and eliminate each guard in order. Blacklist has more of the old Splinter Cell in it than Conviction did, but it's not a perfect revival of the series.

Sam Fisher has been plucked out of retirement, shaved and plonked in command of Fourth Echelon (4E), a younger and sexier take on the original spy agency. 4E roam the world in a spy plane that enables Sam and a gang of sidekicks to breach international law whenever they please.

On a minute-to-minute basis, the level design is an issue. Having a range of gadgets to use means less if you don't need to use them at all, and the linear arenas rarely need to be manipulated as carefully or on as large a scale as in Splinter Cell of old. Realistic difficulty changes this somewhat, removing Conviction's 'mark and execute' feature, axing mid-mission resupply caches and reducing the usefulness of sonar goggles. Being forced to

rely on your noisemakers and sticky cameras is great, but it doesn't prevent environments from feeling narrow and stagey. When you come across a climbable pipe, you know that a developer somewhere expects you to climb it — and that it'll lead you over the head of that guard you couldn't get past.

Awkward, hand-holdy sections like this are the game's other great weakness. One early mission begins with a sniper section where you must eliminate enemies in the right order. You'd assume that if you screw up then the subsequent stealth section will be harder. Not so — you have to repeat it until you do it perfectly.

All missions can be repeated for points, which are assigned in three categories: Ghost, Panther and Assault. Ghost means slipping by undetected and non-lethally subduing guards. Panther is similar, but you're allowed to kill people, and Assault is for people who'd rather be playing a shooter.

Spies vs mercenaries multiplayer makes a return. At its most basic, spies race to hack nodes that mercenaries have to defend — but a series of clever design decisions stop it feeling like any other type of capture point multiplayer. In order to

stop a hack, mercenaries have to find and kill the spy who started the process. This encourages the spies' allies to ambush guards, set traps, or simply try to be distracting.

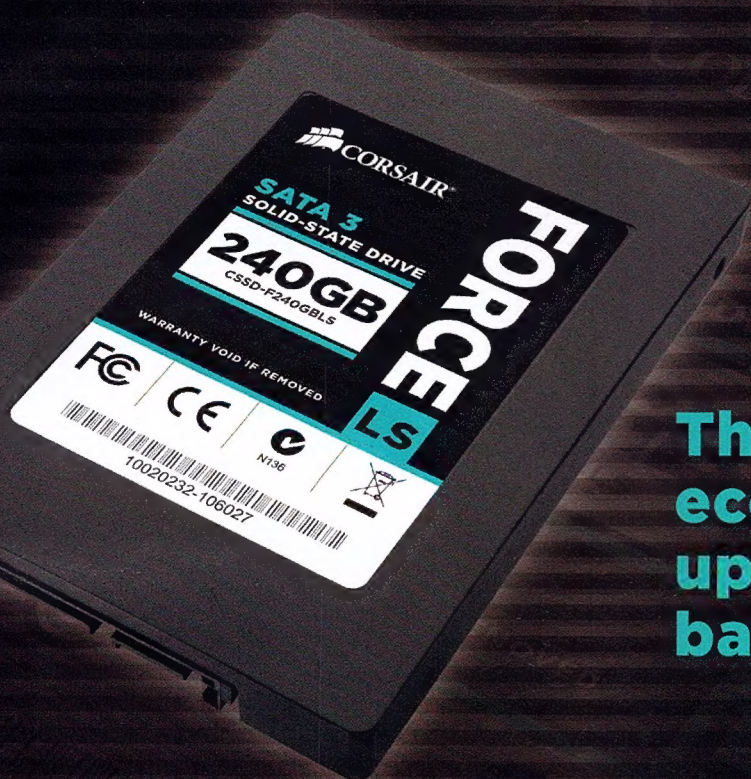
Different maps emphasise different strategies. Hiding in the shadows is an option in some, while others put the spies in situations where direct confrontation is more likely. It's a much more organic marriage of game mechanics and level design than Blacklist manages in singleplayer. I enjoyed sprinting across a room with gunfire pinging at my heels, knowing that I was buying 20 seconds of respite for my hacker friend.

Blacklist is far from terrible, but it's not the classic that Chaos Theory was and learns the wrong lessons from Conviction. That said, this is the strongest the series has ever been in multiplayer, so it's worth peeking into its dark corners. ■ Chris Thursten

Verdict

Wonky mission design and technical issues drag down a solid stealth game that still has enjoyable multiplayer to offer.





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CASES



POWER SUPPLIES



GAMING KEYBOARDS



GAMING MICE



HEADSETS



MEMORY

THE OS THAT WILL NOT DIE

We thought for quite a while that it would live forever...

Ah, Windows XP. You've provided us with so many good times, so many years of service, so many BSODs, so many SPs... (and more than a fair share of Chip Chat stories come to think of it).

But now, the end is most certainly drawing nigh. While XP's share of current Windows installations

worldwide still hovers around a third – a third! – the 12-year-old operating system will only receive official (life) support from Microsoft until April next year, a few months shy of its thirteenth birthday.

Google however, in recognition of the vast number of current XP users still in the wild, has announced it will support

Chrome on XP until April 2015, meaning it should be safe to surf the web on the ageing operating system well into the future.

By which time you may want to consider biting the bullet and finally upgrading to Windows Vista. Or Windows 7. Or Windows 8. Or Windows 9, 10 and so on...

The hills are alive, with the sound of... oh, wait, the gig is over, time for a swan song instead.



What's that rolling across your Google+ profile? Why, it's a tumbleweed!

Loud vs quiet

Twitter: the very mention of the social network conveys an impression of inescapable white noise – a torrent of frenetic, hashtagged missives broadcast knowingly (or unthinkingly) into and onto the public consciousness – and all in real time. But as the company plans to go public and increasingly refines its product into a more mass market, advertiser-friendly and mainstream-oriented offering, reports indicate Twitter is looking to improve upon its private channels of communication. It's an attempt to lure in users on the sidelines who are turned off by the 'firehose' nature of the app's discourse. The irony is that Facebook – by far the biggest social network of them all – is at the same time looking the other way, trying to appeal to teens (who no longer view FB as 'cool') with ever more public posting options...



GhostTown+

While we're on the topic of social networks, some interesting statistics coming out of a study by content discovery firm Shareaholic make for sobering reading for Google+ fans. It's been nearly two and a half years since the search giant launched its own social network to take on the likes of Facebook, but Shareaholic's most recent social media report indicates that Google+ only refers a minuscule .06% of social media traffic to online publishers, while Facebook nabs a roaringly robust 8.11%. Adding insult to injury, of the social networks which increased referrals during the study, Google+ is also the slowest-growing, adding just 6.97% in 13 months. Google+ generated a ton of hype and interest when it was announced in 2011, but these days it seems like more of a ghost town than anything else... When was the last time you logged on? ■



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